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THE

FORESTER'S GUIDE;

OR,

A PRACTICAL TREATISE
ON THE
TRAINING AND PRUNING OF
FOREST TREES;
VALUING AND ASCERTAINING THE
QUANTITY OF WOOD AND BARK PRODUCED
BY COPPICE WOODS.

TO WHICH IS ADDED,
A DESCRIPTION OF
A
NEWLY-INVENTED MACHINE
FOR
MEASURING AND VALUING STANDING TREES.
WITH ENGRAVINGS.

BY
ROBERT MONTEATH,
WOOD SURVEYOR AND VALUATOR, STIRLING,

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TO

ROBERT DOWNIE, Esq.

OF APPIN, M. P.

Sir,

Taking advantage of the kind permission granted me, I beg leave to dedicate the following pages to you;—to this I have been more particularly led by the interest which you take in, and the zeal with which you pursue, the subject to which this volume is devoted; as well as every other subject connected with the improvement of your country.

I have the honour to be,

Sir,

Your very obedient humble servant,

ROBERT MONTEATH.

INTRODUCTION.

The object which the author of the following pages has more immediately in view, in submitting them to the public, is to lay down rules, and describe a method, by which standing trees of all sizes may be accurately and expeditiously measured, and their exact value ascertained. He has also considered it important to state the method of valuing oak coppice wood, at all ages. As connected with his subject, he has commenced the work with a few observations on the pruning, thinning, and the training up of coppice woods; to which he has added the most general, as well as what he considers the best mode of cutting and dressing up these woods. In doing this, he has aimed more at being intelligible than elegant—more at being concise than, by a multiplicity of words, to obscure or cloak his meaning. He makes no pretensions to literary knowledge, he advances what he conceives or knows to be facts—he is not guided in his opinions by theory—he proposes, when he does recommend, what is the result of many years' experience.

It might naturally have been expected that he would have commenced the work with observations on planting, but he declines entering upon that subject, as men of acknowledged information and abilities have already made known their opinions on it. He cannot, however, in passing, forbear mentioning, that the planting and training up woods to maturity in Scotland, at least in many counties of it, where there are many thousands of acres capable of bearing most excellent timber, and suited to no other purpose, is an art as yet but in its infancy. He trusts should these pages ever fall into the hands of those noblemen and gentlemen of his native country, who have land of the above description, and if they should chance to peruse it, after seeing, from the statement which experience has enabled him to submit, the value of an acre of oak wood land properly trained up, that they will not consider such plantations merely as they may ornament and beautify their estates, but as the means also of immense revenues.

He would recommend to those who are inclined to consider the rearing of oak plantations in the light of a national benefit, the perusal of the letter of the late Lord Melville to the late Mr Percival, upon the subject of naval timber, published in July 1810. Coming from the pen of a writer so able, a statesman so profound, dictated by a judgment so correct, and a knowledge of the subject so extensive, it cannot fail to show that it is, and always will be, the soundest policy, to have as abundant a supply as possible of native British oak woods.

In the shires of Aberdeen, Forfar, Inverness, Ross, and Argyle, there are vast tracts of land well calculated for the purpose of rearing timber, situations rendered still more eligible by their local advantage of easy sea carriage. These considerations should hold out inducements to the landholders of these extensive districts, to plant infinitely more than, for several years, they have been in the habit of doing, more especially, when connected with this consideration, that when laid out in timber they would yield a vast deal more than if they had been laid out for the purposes of agriculture.

The objection urged against planting is, that the present proprietor or planter will derive no benefit from his labour and expence, but in the sequel it will be seen that the planter will obtain very considerable advantage from so doing. But granting that the planter does not derive any personal benefit immediately from the woods, the estate is by so much the more valuable, in proportion to the quantity planted. In proof of this the reader is furnished with the following

STATEMENT:

If the proprietor, for instance, plants 100 acres of ground, the trees being placed 4 feet distant from each other, each acre will contain 3422 plants; if it is planted with hard woods, chiefly oaks, and a few firs to nurse them up, supposing it is a plantation intended solely for profit, the expence of plants and planting per acre will be

£6. - - - - - -	£600	0	0
Rent of land at £1. per acre, per annum,*	1000	0	0

---

* It will not be disputed, that there are thousands of acres of land capable of bearing excellent timber, that are not worth 10s. per acre to the proprietors; and that, therefore, the rent of land is here perhaps exaggerated.

Interest on the Rent, - - -				£225	0	0
Expences of thinning, pruning, and training up, for 10 years, at £1. per acre, per annum,				1000	0	0
Total Expenditure, -				£2825	0	0
Deduct produce of 1000 trees thinned from each acre during the first 10 years, at £2. per acre, - -	£200	0	0			
Deduct value of 2422 trees left on the ground after the first 10 years, at £7. 10s. per acre,	750	0	0			
				950	0	0
Total outlay at the end of 10 years,				£1875	0	0
To which add expence of thinning and pruning for the next 10 years, at £2. per acre,	£200	0	0			
Rent of the land for the same period at £1. per acre, per ann.	1000	0	0			
Interest on the Rent for the same period, - -	275	0	0			
Interest on £1875 for 10 years,	937	0	0			
				2412	10	0
Total outlay for 20 years, -				£4287	10	0
Deduct produce of 1000 trees thinned out during the last 10 years, from each acre, which will, at the least, bring 6d. each, or £25. per acre, - - -	£2500	0	0			
Deduct for 1422 trees which fall to be enhanced in value during the last 10 years, and will come to, at least, £35. 11s. per acre, - - - - -	3555	0	0			
				6055	0	0
				£1767	10	0
Deduct from this the value of these 1,000 trees as they were estimated at the end of the first ten years, at £3 2s. per acre,				310	0	0
Thus leaving a balance in favour, of -				£1457	10	0

We have now value on the ground of £14 10 each acre, at the end of 20 years, which is £1457 10, after allowing for every expence. We shall now extend the calculations to a further period.

Rent of other 10 years at £1. per acre, per annum, .	£1000 0 0	
Interest on the Rent, -	275 0 0	
Expence of thinning out 500 trees, and pruning, &c. &c. at £3. per acre, -	300 0 0	
		£1575 0 0
Value of 500 trees, which being now 30 years old, bring at least 3s. per tree, or £75. per acre, - - -	£7500 0 0	
Interest on £2500, for 10 years,	1250 0 0	8750 0 0
		7175 0 0
Deduct from this the value of 500 trees per acre, as they were estimated at the end of 20 years, about £11, - - -		1100 0 0
		6075 0 0
Add balance in favour at the end of 20 years,		1457 10 0
But there are still 922 trees on each acre, each of which is worth at least 3s. 6d. or £161, 7s. per acre, - -	£16135 0 0	
Total in favour at the end of 30 years, -		23667 10 0

We shall now extend the calculation for ten years more.

Rent for other 10 years at £1. per acre, per annum,	£1000	0	0			
Interest on the Rent, -	275	0	0			
Expence of thinning out 422 trees per acre, at £4. per acre,	400	0	0			
				£1675	0	0
But there being still too many trees on the ground to be nursed up to maturity, suppose, therefore, that 422 trees are thinned out from each acre, the value of each will be at least, when they have now attained the age of 40 years, 4s. 6d. each, or £94 19s. per acre.	£9495	0	0			
Interest on £7,500, and on £2,500, for ten years, -	5000	0	0	14495	0	0
But deduct the value of 422 trees, at the rate at which they were estimated, at the end of 30 years—3s. 6d. each,	7385	0	0	7110	0	0
				5435	0	0
Add balance in favour, at the end of 30 years, - - - - - -				£23667	10	0
There are still 500 trees on each acre, each of which is now worth at least 5s. or £125. per acre, - - - - - -				12500	0	0
				£41592	10	0
Suppose an expence is incurred in incidental expences, such as sale, &c. of - - -				592	10	0
A balance is left in favour of the proprietor at the end of 40 years, of - -				£41000	0	0

Thus the value of the wood on each acre, the wood having attained the age of forty years, is L.410; supposing the whole were to be cut down even at this age, the profit would be immense. These calculations may, to those who have paid no attention to the subject, excite wonder if not doubt; but in making them, the author has been careful, rather to lessen than to exaggerate the profits. It is surely no uncommon thing to see an oak tree at forty years of age worth 7s. 6d. but oftener worth 15s.; and it is no uncommon thing to see a plantation at that age bearing 500 trees per acre, which is a distance of ten feet between each, worth that sum.

But if the plantation shall have been carried to the age of sixty or seventy years, and properly thinned, &c. the value will be double what it was at forty years. The author begs to be understood, that he does not mean the thinnings to be made only at the end of every ten years;—this, besides the disadvantage of bringing too much wood into the market at once, ought to be done gradually and regularly. The manner of doing it is laid down in Section I. of the work. From the above calculations it will be seen, that if an estate is to be left to the family of the proprietor, he benefits his posterity as much by planting 100 acres of wood, as by adding 500 acres of good land to the estate. And if the estate is to be sold, the value of the wood will enhance the value of the estate in proportion.

I have known proprietors to have received the profits of three several cuttings of natural oak woods, when they have been cut every 24 years, or from 20 to 30 years, so that a young proprietor entering upon an estate of the age of 21, and enjoying life to a tolerable old age, may derive great advantage from planting and training natural oak woods for coppices, or oak, or even any other wood to maturity. Many other advantages might be enumerated as resulting from the planting and rearing of timber, but this subject has been treated of by persons far better calculated for the task.

The author has known many young plantations much hurt and destroyed by the change of managers or foresters. He has heard managers or foresters newly appointed, say, that unless they did something new, that is to say, something differing from their predecessors, they would be little thought of, even though what they were doing they were well aware was decidedly detrimental to to the interests of their employer, and diametrically opposite to their own better knowledge; if one particular rule therefore, were laid down, it would prevent this ridiculous and injurious procedure, since the new manager would have no excuse for his innovations. It may be proper here to remark that much of the success of a plantation must depend on the person to whom the management is entrusted. If the proprietor have neither time nor inclination to attend personally to his plantations, he ought to choose an experienced person to perform the duty; and, if possible, a person that is settled near the planting or plantation, and one who, from age, &c. is likely to retain the situation for some time; because, it is very obvious, that he who plants ought, if possible, to nurse up the plantation, since, if the plantation do not thrive, his own credit is at stake; on the contrary the proprietor who is always, or frequently, changing his planter, forester or manager of his plantation, must never expect to see his plantation prosper, for the credit of the new manager, &c. rises on the miscarriage of his predecessor; *nay, he even* conceives he has an interest in neglecting what the other has planted, since what he himself plants will be seen to more advantage. His predecessor, being aware that he should not remain sufficiently long in his employment to see his labours succeed, becomes careless and dispirited, since he wants the stimulus necessary to induce him to go on,—in short, he feels he has no interest in bestowing any pains to put the plantation into a thriving condition. Such occurrences have come within the observation and knowledge of the author oftener than once.

It will perhaps be urged, that during a period of profound peace, there is little inducement for planting, or even for taking care of those plantations which are already on the ground, from the great depreciation in the value of timber, which is accounted for by the very extensive importation of that article from America, and the supply from that quarter being inexhaustible, the price will continue low, and hold out no inducement to the planter in this country. Oak wood, it will be said, is not now in demand, as ships of war are no longer required —this species of argument is almost too absurd to require to be controverted. We certainly do at present enjoy a state of peace, but who knows what to-morrow may bring forth ; we do enjoy peace, but who shall dare to affirm how long we shall enjoy it. Other countries are by no means in a state of tranquillity ; and the repose of our own has been threatened. An American war has been and may be still anticipated. A long state of peace, however, is a circumstance to which we have no right to look forward.

In the event of an American war, the supplies from that quarter will be in a great measure cut off ; and, as timber does not resemble any other crop, sown in spring, and reaped in full maturity in autumn, a time of peace is fully as proper a season for planting as a time of war. The present holds out many advantages for planting,—&c. work is scarce, and labour is done at an easy rate.

It is in the power of the rich to do much good by employing the poor in such a manner as eventually to benefit themselves; and it is the wish of the individual who publishes this work, to point the manner, in one instance, in which it may be done, with mutual advantage to the employed and the employer. It is with this view, more particularly, that he calls upon the attention of the land-holders, more especially of Scotland, to the further planting and improving their waste-lands, because there are many thousands of acres in Scotland, that are calculated for rearing and bearing timber, that are of no use for the purposes of agriculture or pasture. The following pages, he trusts, will point out such advantages as will induce most, if not all, the land-holders, to turn their most particular attention to a subject, which, if pursued, will be productive of the most essential results.

Though ship-building on behalf of the government is not now so extensively carried on as formerly, still the building of ships of war is carried to such an extent, even at the present moment, as would, in other countries, be considered enormous. Add to this, that Britain, the first commercial nation in the world, possesses more merchant ships than almost all the other countries of Europe; it must follow, that oak, even in times of the most profound peace, a period favourable to commerce, must meet with a ready market. British oak, more especially Scotch oak, must always be in demand, from the well-known fact, that a Scotch oak plank will last thrice as long as a plank of American oak.

It has been said, that there is no danger of timber becoming scarce in this country: but if we consider the great quantity used in ship-building, we must hesitate to admit this assertion, and contend for the contrary, namely, that there is every reason to suppose it will become scarce, more especially should the supply from America be cut off. This will be the more readily admitted, when we consider the enormous quantity of wood required to build a seventy-four gun ship.

Mr Marshall, treating of woodlands, &c. says, " A seventy-four gun ship swallows up 3,000 loads* of oak timber, which is no less than 150,000 years, and will continue to do so forever, if managed with proper attention.

---

* A load of round timber is 40 feet, and of square timber 50 feet, which 40 feet of round or rough timber is reckoned a ton, and 50 of square timber a ton.

Sonien is in Brabant, about the distance of a cannon-shot from Brussels, and stretches towards the south as far as to Brienne Alleud, and Brienne le Chateau, for the space of three leagues. This is a wood really great and magnificent, so that its circumference comprehends more than seven leagues, that is eight thousand bonieres of land; every boniere contains four hundred measures, and every measure twenty Roman feet; and, according to the use and custom of the country, there are an hundred bonieres of this wood cut every year, which brings in a yearly revenue to the king of about fifteen thousand florins, or twenty-five thousand crowns; and thereby, at the end of every eighty years, the wood that was cut grows again, and renewed as at first, with very tall and great trees of all sorts. I have computed the Roman scudi to be worth about 5s. 1d. Sterling, so that the 25,000 scudi will amount to something more than £6,350 Sterling. This calculation was made about two hundred years ago, before the wealth of the Indies had circulated through Europe, and reduced the value of money, so that this £6,350 may be reasonably supposed to have been, at that time, equal to near three times that sum at present. From which computation, instead of having said £6,350, I would be much nearer the truth to have called it £18,000 Sterling.

I hope to be able in the sequel, clearly to shew the great profits and advantages that may be derived from natural oak woods, even in our own country.

THE

FORRESTER'S GUIDE.

SECTION I.

OF THINNING AND PRUNING TREES,

INTENDED TO BE NURSED UP TO MATURITY.

THINNING and Pruning Trees is a subject that has been variously treated of by different authors. Some are for thinning and pruning almost none; others are for pruning a great deal, and thinning little. It would be of the most essential advantage to plantations in general, if one rule could be laid down, and followed up throughout all the stages of plantations, with regard to their management and previous planting; for then it must, of course, follow, that however short lived one manager of a plantation might be, his successor behoved to follow up the same plan, that he had begun, and so on in succession. Supposing you have a plantation to begin to look after that has been planted with all kinds of hard wood and firs, promiscuously, and where the plantation is designed chiefly for profit, not for ornament, and the firs having been planted with a view to nurse up as well as to shelter the hard wood, which is of great use, and is absolutely necessary in situations that are much exposed, when the plants, call them now trees, arrive at five or six feet high, for it is difficult to say at what age of the planting this ought to be done, as the growth will depend much upon the situation and soil; but at five or six feet high, go through the plantation, take away every fir tree that is in the smallest degree impeding, or likely to impede, the growth, or over-topping, or likely to over-top any of the hard woods, taking care to leave a sufficiency of firs for shelter, and particularly on the outsides, or on those sides of the plantation most exposed, going through the plantations regularly every year, or every two years thereafter, and taking away gradually, as need may require, every fir tree, till, at the time the hard wood trees arrive at the height of from twelve to fifteen feet, and the trees being of this height, having the hard wood trees from eight to ten feet distant. Having done this part of the work gradually, till the trees are arrived at the height of fifteen feet, there should not be a single fir tree in all the plantation. It will be easily understood, that by the trees to be taken away, I mean nursing trees, or trees for training up the others, unless round the outside or places most exposed, where they may be of use to shelter the interior of the plantation. Supposing now, when your trees are at the height of fifteen feet, you have a plantation totally of hard wood, and that too of the most valuable kinds, such as oak, ash, elm, beech, spanish chesnut, and plane, I mention these kinds, not only as the most valuable, but as they will, most generally all grow, thrive, and come to maturity on the same soil, the oak excepted, which will thrive and grow to maturity among whinstone rock, where there is hardly any soil perceptible, which can be easily seen in the neighbourhood of Inverary, Argyleshire, and in many places of the Highlands of Scotland, and also on the face of the Ochil Hills, such as on the estates of Alva and Airthrey, where there can be seen, large oaks growing almost out of solid rock.

Here it will be necessary to leave the operations of thinning for a little, and say something of pruning, which is a work that ought to be done with great care and attention, as much depends of the growth, and also the shape, or rather the valuable purposes that a hard wood tree may be made to answer, on its being timeously and properly pruned. In this case the infallible proverb will hold good,—" train up a youth in the way he should go, and when he is old he will not depart from it."—Trees, by proper management, when very young, can be brought to almost any shape.

SECTION II.

OF PRUNING.

SUPPOSING you have a plantation, such as I have been describing, in the way of thinning, and supposing the plants to have been properly pruned before put into the ground, which ought to be the case, and is now generally attended to, after the first thinning, which we suppose is done when the trees are from five to six feet high, go over the whole plantation again, and with a knife prune from off the ash, the beech, and the plane, all such stems and shoots as may seem to be entwined with the main stem, making and keeping the main stems as clean as possible, and drawing them up to a very little top; and, at this time, when any of these kinds of trees have two stems, each contending for the superiority, if it can possibly be done, without a material injury to the main stem, it ought to be lopped off, and carefully dressed up, as the value of these trees depend entirely on the cleanness, straightness, and tallness of their boles or main trunks; the value of the branches, even though they become measurable, especially of the beech and plane, being, in many places of this country, next to nothing,—this is the time then to begin to train up the ash, the beech, and the plane, to be valuable trees. The value of the oak, the elm, and spanish chesnut, depends a good deal on their being crooked, as they are all used in ship building; and indeed crooked elm is valuable for fillies or treads for coach and cart wheels, and these trees require a different treatment in the way of pruning. If you have an oak, an elm, or chesnut, that has two stems, as it were striving for the superiority, lop or prune off the straightest stem; and if a tree that is not likely to be of such value be standing on that side, to which the stem left seems to incline to a horizontal position, take away the tree, and give it every chance of growing horizontally. At this time it will be necessary to take away a few of the perpendicular shoots off the horizontal branch; and, indeed, if these branches, which is sometimes the case in these trees, seem to contend, take away most of them, but if they do not it is better at this time not to prune these trees over much, except the crooked shoots on the horizontal branch, till they arrive at the height of fifteen or even twenty feet. By this time it will be easily seen what kind of tree it is likely to form ; and, if it inclines to grow crooked, lighten a little the top of the tree, by taking off a few of the crooked branches on the straighter side, allowing all the branches to remain on the side to which the tree inclines to crook, to give it more weight, and to draw most of the sap or juice that way, and it will naturally incline more to the crook ; at the same time clearing away any other tree on the crooked side, that may be apt with the wind to whip the side of the tree to which it inclines to crook. Also taking away such tree of less value as may prevent it from spreading out to the one side more than to the other.

If the tree be considerably advanced, say to twenty feet or more, it should be observed that some of the shoots from the main branch of the tree (for such it may now be called) that was and is growing, and maintaining a horizontal position, if these shoots are rising perpendicularly from it, they ought, even at this advanced period, im-

[illegible] taken off, having always mad [illegible] or small twigs, on the extre- [illegible] branch and on that part of it in- [illegible] to prove the means of draw- [illegible] the sap to that part of the tree, and [illegible] grow still more horizontally. By [illegible] attending to these few hints in the way [illegible] and training up trees for crooks, ex- [illegible] will soon shew you [illegible] from it. I have my- [illegible] experiment with several oak trees [illegible] high that were a little in- [illegible] and that had also a main branch [illegible] a horizontal position. In the course [illegible] twenty years I had the pleasure of [illegible] of these very trees grow so very [illegible] the branch would work in with the [illegible] or body of the tree, to a complete [illegible], which is the most valuable of [illegible] trees. And as ten trees of crooked oak is required for one straight one, it is of the most essential consequence to have crooked oak trees; (and, besides, an oak tree properly crooked that will answer for a large knee—say the main branch to be fit to work in with the body or trunk of the tree without much waste of wood,) is nearly double in value the same number of straight trees; and, indeed, knees of oak are extremely scarce, and difficult to be got. Elm and chesnut are not so much used for knees as for flooring and fikethoop timbers of a ship, which are also very valuable. By carefully attending to these hints a great many valuable crooks may be obtained.

To return to ash, beech, and plane,—the same method as is used in pruning them at five feet high, ought to be pursued, and carried on until the trees shall have arrived at from twenty to thirty feet high; taking care to train them up to grow as clean, straight, tall, and with as few branches as possible; as their value, either for machinery or husbandry, depends on their being straight and free from knots, and beech in particular for ships' keels and planks; therefore there should be no pruning allowed on trees after they are from twenty, to thirty feet high. Indeed the sooner the operation of pruning is finished the better, because when done (though sometimes necessary) when the trees are arrived at an advanced age, and even done in the best and most careful manner possible, it not only has a tendency to injure the growth of the tree, but it also leaves blemishes in it, which, though apparently healed up, and the tree looks well, and has not the least appearance of any blemish, when cut up by the tradesman after, shews blemishes, altogether unforeseen when the tree was growing; and entirely owing to bad or late pruning, which renders the timber of such a tree almost useless. The pruning should therefore be done when the tree is young, and taken close in to the interior of the bark, with a very sharp instrument; and taking particular care not to hurt or injure any of the bark but where the branch is cut off.

If a large branch requires to be taken off any tree, which may be the case if the branch be dead, supposing this, it is better to take off the branch rather than to let it rot off, for then it generally leaves a wound in which the water lodges, and consequently leaves a blemish in the trunk of the tree. In taking it off, first saw it through about eight or ten inches from the trunk. The weight of the branch will cause it to give way before it is quite cut through. On the other hand, if at first cut close to the trunk it would split down, at any rate it would tear the bark from the body of the tree, and of course very much injure it. Besides, if cut close to the tree, at first the weight of the branch, although it was so far cut below to save splitting, would leave small rends which the heat of the sun would open, so as to receive water, and consequently very materially injure the tree.

In the event of cutting the branch twice, the second cutting of it prevents all risk, and when cut off with the saw, ought to be dressed up with a sharp instrument to prevent water from lodging in it; and a little paint or coal tar might be spread over it, which greatly prevents either the sun or the wet from proving injurious to it. But, unless in cases of a very particular nature, large branches, as I have said before, should not be cut off.

We shall leave the subject of pruning, and return to thinning as in page 27. Suppose the plantation is totally of hard woods, of above fiteen feet high, and after the operation of pruning, for at least one year, of such as required pruning, was finished, it will be proper to thin them gradually year after year, and to take away in a regular manner those trees more especially that are not thriving, and are the most unlikely to become valuable; and, at the same time, endeavouring to keep the remaining trees as regularly as possible, in order to have a complete crop upon the ground. This mode of thinning, or weeding, must be carefully attended to, so as not to make gaps or blanks in the planting; and particularly at such places of the plantation as are much exposed, keep the trees there always a little closer or thicker.

The Manager, or Forrester, need not be told that the thinning will now be coming to be of some value; and if to be sold in whatever way, they ought always to be cut down either by or under the constant attendance of the person to whom the care of the plantation is entrusted; and he ought to take particular care that the cutting of those trees to be taken out, ought not to be allowed even so much as to fall on those intended to stand, because although little or no damage may be done apparently to the standing tree, yet it has a tendency to loose it at the root, and thereby hurt its growth. Thus, by carrying on the operation of thinning in a gradual manner, it will, now and then, as the thinnings are becoming more and more valuable, be bringing in a considerable sum to the proprietor, and this operation must be carried on as need requires, till the trees are from thirty to forty years old, and at this time the plantation should be brought to such a state of perfection, that the trees, (if ash, beech, or planetree,) should be at least from twenty to twenty-five feet from each other; and if oaks, elms, or chesnut, say crooked or large topped trees, from twenty-five to thirty-four feet from each other, according as the tops of the trees are in extent, so the distances must be regulated by the tops of the trees, in order to keep them from hurting one another, and not at all by the roots. Having proceeded so far in thinning or weeding the number of trees now remaining on the grounds, they may be allowed to remain till they are 60 years old, and then thinned out to 35 feet distant. It may be said that there is still too many for a crop, that is to say, more than the ground will carry, but it may be observed, that trees are liable to many accidents, both by wind, lightning, &c. &c., so that making this allowance, it will be necessary to keep them a little plentiful, rather than have them too much thinned, and have thereby but a scanty crop. It will be here observed, that I have, all along, been considering a plantation planted for profit, not for ornament, and the planter, or at least the person who began to train it up, when the trees were five or six feet high, still continued to train up, or at least the same rules are still to be followed up. Allow me to say, that the profits and advantages from a plantation trained up in this way, will be immense, as will be shown in a following part of this book.

SECTION III.

OF NEGLECTED PLANTATIONS.

It is now necessary that something should be said of the thinning, pruning, &c. of neglected plantations, of which there are, I am sorry to say, a great many in this country neglected, either from a want of duly considering the profits that may be derived from them, if even yet attended to, or from an opinion that there must be a good deal of money laid out in the first instance, and that the thinnings, even for some years, will not pay the expences. It is a pity there should be any obstacle in the way, and I hope, through time, they will all be removed.

Supposing now, you have a plantation to begin to, that has been planted perhaps twenty or thirty years ago, less or more, and supposing an axe never had been used, or any thing done to it in the way of training up, it matters not what has been the design, whether it was intended to be all hard wood, all firs, or part of all kinds, you must now consider the crop that is on the ground, or what is likely to be a crop, and go over it, and mark out for standing, in your mind, those trees, whether hard wood or firs, that are most likely to arrive at maturity, and immediately set about thinning out a very few of the worst of all kinds as they come in the way; at the same time pruning up, as you go along, those hard wood trees which you intend to stand.

If the planting is very thick and close, you must not thin it above half what you are convinced it requires at first, because if the air is suddenly allowed too free admission, it will rather injure than benefit the planting; and more particularly so, if the planting be much exposed. I have known a plantation on the estate of Dunnipace, in Stirlingshire, that had been thinned over much after it had attained a considerable age. In the winter of 1814 the wind struck in upon it, and in one night rooted up mostly every tree, leaving only about 50 or 60 standing, on an extent of nearly five acres of ground. As the trees were from twelve to eighteen feet in height, the desolation was tremendous, and even the expence of clearing the ground was great, in consequence of the large size of the roots. I could mention many other cases of a similar nature that have come under my own observation.

In a plantation, therefore, of this kind, I would recommend pruning rather than thinning, so that after having given it a very scanty thinning, let it be all properly pruned; and in this case great care should be taken not to cut all the branches or shoots from off the trunk or body of the tree too much, but to thin or lighten the tops a very considerable deal, they may not be left at all top heavy, which is a great mean of making them not only easily blown down, but also easily shaken with the wind, so, that although not blown entirely down, they are apt to lose their growth, if not altogether, for at least several years. In this case it will be seen, that thinning very sparingly at first, and gradually, as the trees begin to take new hold at the root, is necessary. After having pruned the whole in this way, not to destroy the look of the top of the tree, but as much as possible to lighten it, it should remain in this state for at least two if not three years, when the operation of thinning ought to commence, and be carried on gradually till finished, in the same manner as described in Section I. page 26, but with more caution, taking care to give those that you intend to train up to maturity, always time to fix at the root, so as to resist the effects of high winds, at least in large numbers, for it is almost impossible but some will, in a plantation of this kind, be blown down. Endeavour always to keep the ground as regularly full as possible of the most valuable trees, particularly when you have a choice. At all events, endeavour to train up such trees as you have on the ground, that you think in any degree thriving, and by no means cut out and make great blanks, as some have suggested to be done, and say they replace them with new or young plants. In such a case I would apply the old Scotch proverb—you will lose bundles gathering straws—for experience has told me, you will lose your plants and the expence of planting, &c. &c.

SECTION IV.

OF FIR PLANTATIONS.

As to plantations consisting wholly of fir, a considerable difference of opinion has and does exist. Some, and indeed a great many, are not for thinning at all; hence they say firs always thin themselves, because when too close pressed, those that are most thriving soon overtop those that are not so thriving, and by this means they soon kill them; so that a plantation composed entirely of firs, does, by degrees, thin itself, and should be allowed to do so. Others again say, that fir plantations should be both thinned and pruned in the same manner as other plantations. My own opinion, however, is, that a plantation composed entirely of firs, and planted with a view to and for profit, should be regularly thinned, though not to such a degree as hard wood, because the purpose for which fir is applied, requires the trees to be perfectly straight, and as clean and as free from knots as possible; and as their value chiefly depends on this, it certainly is, and ought to be, the chief object in training them up for that purpose. Therefore, when trees in a fir plantation arrive at the height of five or six feet, they should be regularly thinned out by degrees, year after year, till they arrive at the height of between twenty and thirty feet; and at this time the plantation ought to have been gradually thinned, so that the trees shall not stand nearer than 20 or 25 feet from each other; and, having a fir plantation thinned to this distance, when the trees are from twenty to thirty feet high, it should never be touched in the way of thinning, but left to itself. At this distance, there is plenty of room for them to grow large, straight, and tall, the only properties that can be possessed by a common Scotch fir.

If the plantation consists totally of larch firs, they ought to be kept a little closer, particularly on the outskirts of the plantation, as they require more shelter than the common Scotch firs; or where there is a mixture also, if much thinned, the larch grows very crooked, which renders it of less value, unless when it is to be used in ship-building, which has not yet become general, though it is a kind of wood well suited for that purpose.

Pruning Trees.

No species of fir tree whatever should be pruned, because in pruning they bleed so much, that it very materially injures the growth of the tree, when the branch is taken off in a thriving state; but when a branch on any kind of tree, but more especially a fir tree, begins to decay or rot, it should immediately be taken off close to the bole of the tree, as formerly advised, because if permitted to rot off, though it be only a small branch of a fir tree, it always leaves a hole in the trunk where it comes off from it. And although this hole soon fills up, and does not in the fir, as it may in a hard wood tree, lodge water, so as to injure the main body of the tree, yet it always leaves a black mark, which if it ever grows into a knot, will be seen after the tree has been cut down and sawn into boards. Thus a knot in a fir tree, from a branch that has been allowed to rot off, is always loose when it comes into the hands of the tradesman; in the working the knot comes out and leaves a hole in the board, so that the board is frequently, after having undergone a very considerable deal of workmanship, rendered useless; whereas, if the branch is pruned off close to the bole of the tree, before it be quite rotten, if it does leave a knot in the tree (but frequently, if the tree stands a considerable time after, it does not,) it will always be a firm knot, and will by no means come out, even though sawn out into boards half an inch in thickness, so that to cut off carefully the dead branches from the fir tree is of very material service to them in point of value.

Neglected Fir Plantations.

If a fir plantation has been neglected till it has arrived at twenty or thirty, or even forty years of age, if the soil be good and the trees have taken a good hold of the earth, it will be of very great service to give it a little thinning, but to do it in a very sparing manner; but still, it would be beneficial to do it a little, and especially in those places where the plantation is most sheltered. But if the soil be rocky, and the roots running mostly on the surface, (which is often the case with the larch fir in particular,) it ought hardly to be thinned at all; and, in this case, it may be advisable to allow a fir plantation to thin itself, if it cannot be done without the risk of trees not only being blown down, but loosened at the root by the wind, which is almost as injurious to the trees as being completely blown down. But in every case where it can be done with safety, plantations of fir, as well as of hard wood, should be thinned, because if properly attended to, the trees will make more progress in two years the one way, than in three the other. The thinnings also will pay much more than the expences, and ultimately the crop on the ground will be better.

SECTION V.

OF COPPICE OAK WOOD.

Although in the preface I pledged myself to say nothing of, or interfere with, planting, I must so far infringe upon this pledge, as to make one observation, and the importance of it alone induces me to do it. This observation regards the planting of oak coppice lands, that is to say, an oak plantation that is intended for a natural wood, to grow from the old stock, and to be cut regularly every twenty or twenty-five years. Oak plants, for this purpose, should be exactly eight feet asunder, and in the most exact manner, particularly when the nature of the ground will admit of it, and a few firs put in amongst them to nurse them up; but as soon as the oaks will do without the firs, they ought immediately to be taken away; and at all events as soon as the oaks arrive at the height of six or eight feet, there should not be a fir tree left amongst them, unless it be on the outskirts, or in places where the plantation is very much exposed, and where it may be necessary to have a few for shelter before the first cutting, as after that there is no more occasion for shelter to a natural oak wood, unless in the entry to a den where the wind is accustomed to break in upon it, when blowing from certain quarters with unaccustomed violence. In this case, it will be proper to have a belt of planting of at least forty feet wide, altogether of firs, and these always kept very close to shelter that part of the coppice most exposed.

If the spot of land intended for a coppice plantation, have some marshy places in it, that will not carry oaks, let them be planted with ash, as ash will thrive in wet situations, when oak will not, and ash will grow naturally, or from the old stock, in a similar manner with oak, and is also very valuable at the same age, and if it be found too wet for ash, let it be planted with birch, as it answers to cut along with the oak, and is of considerable value, as the bark sells at half the price of the oak bark

None of the oak trees, in a plantation newly formed, and coming forward, intended entirely for a natural oak, or coppice wood, ought to be pruned before the first cutting, as, in proportion to the branches they bear, will the quantity of the bark be increased; so that all should be allowed to grow on them, and if any of the oak plants have given way, the ground ought, as soon as observed, to be planted up; although they should not come forward to be as good trees as the others at the time of cutting yet their roots will answer the same purpose when it comes to be cut for the new growth.

An oak wood so planted, and intended for a natural oak coppice wood, ought to be cut from the plant, say the first cutting at the age of fifteen years, or at the longest not to exceed twenty years, because at this age the roots are of sufficient size to carry two or three shoots, and the natural growth is much more rapid, and at the same time more sure, and less liable to misgive than the plants. There will be besides on the ground three times the crop, after the first cutting, and there will be from even the second cutting, three times the quantity of bark, and twice the quantity of wood.

Natural oak woods cut the second, third, or any after time, say from the natural stock, ought not to be cut sooner than twenty-five years, nor later than thirty, because at this time the bark has arrived at a degree of perfection even more so than when allowed to remain after the age of thirty, because after that age it gathers a quantity of what is called cork, that is to say, the outside, or skin of the bark becomes rough,* and there grows in it a light substance resembling cork, which is not possessed of the principle of tanning.

Oak trees, at the age of twenty-five or thirty years, have as thick a rind or fleshy part of bark as when they arrive at the age of fifty. What may seem strange, but it will be found to be fact, and I draw my assertion from personal experience, that the bark from a natural stool of oak wood, at the age of twenty-five to thirty, taking the timber measure, will produce on weighing as much as the same measurement of an oak tree at the age of fifty, taking the measurement of both trees, or otherwise.

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* I suppose the reader need not be told, that the bark of every tree has two substances, and on some trees it has three. When there are two, the outer is called the skin, and the inner the flesh of the bark.

Thus, after the age of thirty, for the next twenty years, the bark gives more to the cork than to the rind or fleshy part which is the most valuable. The tanners, or consumers of bark, will give L. 1, and sometimes L. 1, 10s. per ton more for the clean, than for the bark which is covered with cork; in other words, they will give more for the bark of trees that are only twenty five or thirty, than for the bark of those that are fifty and upwards.

For some years back, the natural oak woods have been cut at the age of about twenty years. But I consider this as rather an early cutting, unless in cases where the woods have not been properly attended to, and where they ought to be cut down in order to improve them.

SECTION VI

OF CUTTING COPPICE, OR NATURAL OAK WOODS, FOR THE GROWTH.

The cutting of young natural oak woods, or dressing up the roots or stools, as they are commonly called, for the growth, is that part of a forrester's duty, or whoever has the charge of natural woods, that demands the most particular attention, since one stool, improperly cut or dressed, spoils the growth, not only for the next cutting, but loosens the root, and does such injury as it can never afterwards recover.

The particular manner in which stools should be cut and dressed up, in order that the new growth may spring up not only for one year, but that they may continue strong and vigorous during the age of the coppice, and to preserve the same stools in health and growth during succeeding cuttings, is a subject that has given rise to a variety of opinions, not only among forresters or managers of natural woods, but also among wood cutters. I have had occasion, for the last twenty years, to attend public or private sales of coppice or natural woods, in almost every shire in Scotland; sometimes not fewer than ten or twelve sales in a season, and on an average not less than five, and out of these, very few, I had almost said none, of the articles or conditions of sale regarding the cutting and dressing the woods, &c. when read, gave general satisfaction, even to those who pretended to be judges.

It would prove mere waste of time, and would occupy more room than can be spared in a volume like this, intended for a pocket companion, to state the variety of opinions that have been advanced on this subject—the task would be by no means difficult, but the reader would derive no advantage whatever from it.

I make no pretensions to laying down a perfect rule, I make no claims to perfection, but I hope and trust the rules which I shall lay down will give satisfaction to those who are in any degree competent judges, and such as, when put in practice, will recommend themselves.

Let us commence with a natural oak wood, to be cut for the first time from the plant. If the wood be sold to a merchant, he, very naturally, tries to make all the wood and bark he possibly can from it, and whenever he begins to cut, (this is quite customary.) he sends a person, generally a woman, before the cutters, to strip off part of the bark from around the root of the tree, from the ground proceeding upwards for two or three feet. This is commonly termed shaving or hosing the tree. Its design is chiefly to preserve any of the bark from being wasted or lost, when the axe is applied. In this operation, however, a very destructive, and not unfrequently, a mortal blow is given to the root of the plant; for it often happens that the person has no sooner got in the iron, or instrument, intended for raising the bark, and has raised so much of it as to get a hold of it with the hand, than he tears it downwards, till it runs under the earth, and then it naturally separates the bark from the root of the tree before it breaks, and is the most effectual method that can be adopted for destroying the growth of the stool.

The person upon whom this duty ought to devolve, should be the most careful, as well as the steadiest in the employ; and it would be an additional recommendation, if the person should have been accustomed to this operation.

This person ought to be furnished with an instrument with a sharp cutting edge, and should receive instructions before commencing to strip the bark, to trample down the long grass or foggage all round the root, and then, with the cutting edge of the instrument, to make a circular incision into the bark so deep as to reach the wood, at about an inch above the surface of the earth; thus the bark when taken off will injure no part of that which is below the circular incision.

The root of the tree being thus prepared, the cutters ought to proceed to their part of the work, not with an axe however, as is most generally recommended, but with a saw, because in cutting with the axe, unless the root of the tree be so small in diameter as to be severed in one or two strokes at most, the axe loosens the root to such a degree, that it not only loses the present year's growth, but often fails altogether to grow. Therefore if the diameter of the root be six inches, or upwards, it should always be cut with a cross-cut saw; entering the saw about half an inch above where the circular incision has been made into the bark, if a small tree; but if the tree be ten or twelve, or more, inches in diameter, the saw ought to be entered two inches above it.

There are two advantages to be derived from cutting with the saw;—it has no tendency to loosen the root of the tree, but leaves it in such a condition as to be more easily and properly dressed; it also saves a portion of the wood that would otherwise be destroyed by the axe. On no pretence should oaks of the sizes above mentioned be cut with an axe, but always with a saw. Having cut through the tree with a saw, take a sharp adze, and round the edges of the stool or root, going close down to the surface of the earth, taking with the adze both bark and wood, sloping it up towards the centre of the stool, taking particular care always that the bark and wood both slope alike, as if they formed one solid body,—being sure always that the bark be not detached from the root.

It is of little importance how far up the slice is taken off, or whether the root be rounded close to the centre, or drawn up to a point, unless it has been cut hollow in the centre with the saw; but, if done in this way, it will be necessary to round as much of the edges as to make it have a declivity from the centre, so as not to lodge water on the top.

If the sawyer would incline the teeth of the saw upwards, it would prevent this occurring, and would render the stool easier dressed. An objection has been made to this mode of cutting with the saw, as taking up too much time; but I have found that two men, with a cross-cut saw, kept in good order, will cut as much as two men will with an axe,—and wood will also be saved, and the work done to much better purpose than when cut from the plant with an axe.

I have often found in cutting trees from the plant, where the root did not exceed ten inches in diameter, that by cutting them with the saw without being hosed or any of the bark being taken off before the saw, but to enter the saw about an inch above the surface of the earth, and inclining the saw to run up an inch towards the centre of the root of the tree, cutting it from both sides, that this makes an excellent cut, and all that is afterwards necessary is taking a sloping slice all round the outside of the root, say about two inches broad down to the ground. In attending to this you have a very well dressed up stool, nearly formed by the saw itself, which is both speedily and easily done; and in this case there is no danger of loosening the roots by the blows of the axe.

Having thus described the cutting of a natural wood for growth from the plant. I shall now proceed to consider the method of cutting old natural woods, such as have been cut once or twice, or a number of times, which often require a different treatment.

SECTION VII.

OF CUTTING NATURAL COPPICE WOODS FROM THE OLD STOCK.

It was formerly the custom, and even at this time, some insist on its propriety, to cut trees, intended to grow again, four, five, and even six inches above the surface, but a worse practice, or one that more points out its own fallacy in natural woods, cannot be conceived. When this is done, you will see hundreds of the stools two, three, sometimes four, feet above the surface of the ground; and many of them have attained such a size, that the main body of the root is altogether out of the earth and this root is nourished by perhaps no more than three or four fibres or small roots, and these must, of course, afford a very scanty supply to four, six, or even eight trees, which should be produced and supported by such a stool. Hence, we generally find, that trees produced from such a stool, are neither so healthy; nor do they produce the same quantities of bark or wood, as stools do which have been dressed, as they spring up from the ground. Besides, the shoots, for the first year's growth, are so very tender, that if there is a fall of snow during the winter, they must sustain all the weight of the snow that the whole stool carries, or nearly so, and the chances are that they are broken off, and the year's growth completely lost; whereas, when the stools are cut, so as to be dressed down to the ground, the snow can have very little effect on them,—the stool bears no more weight than its proportion with the ground.

It will be found, upon experiment, perfectly evident, that stools dressed down to the surface of the ground, (taking care always not to loosen the bark from the root, or allow it to be peeled off in the smallest degree below the earth, but rounded down level to it,) that these stools will send forth the most vigorous shoots, and stand the weather, and be the stoutest and best throughout the age of the coppice.

But to redeem these old stools I have tried the experiment of cutting off with a saw the old root close by the earth, or I have even cut it away altogether, when, as is frequently the case, one can see between the main root and the ground, and dress up the ends of the fibres or small roots that were supplying the old one with nourishment. In this case I have often seen, and have had most excellent shoots; and the chances are infinitely greater, that good shall be done in following this plan, than from allowing shoots to spring from the old stock.

One reason why old stools are apt to get above the surface of the earth, is that, after the first cutting, the stool, having sent out two, three, or perhaps four different shoots, which are all to be nursed up to the age of the coppice, and, when they are to be cut, which indeed is the speediest way, each of these are lopped off with the axe, and this makes a very good stool, and requires little if any dressing up, because the stool, when cut from the plant as directed, and having been rounded at the top, it still retains this form, and the shoots coming up around the edges of the stool, by cutting them separately, inclining the edge of the axe from the earth upwards to the centre of the stool, taking care to leave the bark and wood, as if forming one piece, on that part of the stool close to the earth, when the axe is first applied.

In cutting in this manner from the old stock, there is no more danger than in cutting with the saw, as the root is not now so liable to be loosened as when cut from the plant. This latter method, though it answers exceedingly well for the first or second cutting, after having been cut from the plant, yet it has a very great tendency, in course of a few cuttings, to raise the main root, or stool, to a considerable height; and, as soon as the main root raises itself about ten or twelve inches, it should be cut through with a saw, and dressed up in the manner described in cutting from the plant.

I have often seen an oak stool on the face of a rock, having one of its sides level with it, while the other side was perhaps two or three feet above it, and from this latter side the nourishment is more generally received, and therefore the shoots sent out from a stool of this description are in general small—not arriving, at the time of cutting, at half the size that from a well dressed stool should be expected.

In such case I have tried the following experiment, and have found it to answer extremely well. I made use of the saw, and in the following manner :—I enter it at the higher part where it is level with the earth, inclining it, during all its progress, downwards, until it comes out close by the earth at the lower side. In consequence of this manner of treatment I have found the shoots come out from that part of the stool where it possessed most moisture, and receiving their nourishment, as it were immediately from the earth itself, and not altogether depending on the old stock; and these shoots will be found to make as much progress in one year, as they formerly did in three. And whereas formerly the old stool only gave out two or three puny sprouts, which, from the weight of snow in winter, and other causes, can never obtain a perpendicular or upright position, but on the contrary come out sloping, but by cutting in this manner you will have double the number of shoots from the same stool, and these shoots will also be taller, straighter and stronger, and the stool, from the cutting, will consequently be proportionally more valuable.

There is scarcely a coppice or natural oak wood, in the Highlands of Scotland, but abounds in stools of this description, but by pursuing the plan above recommended, their improvement will be rapid and great, their appearance will be bettered, and their value increased. Having thus recommended what I conceive to be the best method of cutting and improving old natural woods, I shall next consider the *time* proper for cutting, but as this is a subject which is pretty well understood, a few hints will suffice.

SECTION VIII.

TIME FOR CUTTING OAK WOODS.

Every one must know, that if a tree is to be barked, the time most proper for cutting is when the sap is up the tree, and more especially when it is ascending, or as soon as the bud begins to make its appearance, which, if the spring be favourable, will be in the end of April or beginning of May. Birch and larch woods are also peeled, as their barks are used in tanning, but these will peel nearly a month earlier than the oak. Should there be no frost, birch and larch may be peeled about the beginning of April; but the birch is commonly allowed to stand till July, and the peeling of it is commenced after that of the oak has been completed, and for this particular cause, there is an outer skin upon birch bark which requires to be taken off, as it is of no use to the tanner, and renders that part which is of use more difficult to be ground, and the month of July is the only time at which the two barks can be separated with ease, as at this time the juice or sap has made its circulation through the tree and bark, and this circumstance renders the separation more easy.

From the beginning of May to the middle of July is the usual time for barking the oak. The earlier in the spring this operation is performed on the oak, both for the growth, if a natural wood, and for the bark, the better. When the sap has begun to rise, the bark will easily be detached from the wood, and it ought then to be taken off without loss of time, and if the whole could be taken off before the leaf is completely developed, the bark would be better. After the sap has arisen to the leaf and new growth, the bark becomes more dry, and requires more beating to separate it from the wood. And when what is called the black sap is descending the tree, the bark taken off is black, and loses its original colour; and at this time also the bark begins to throw off a scurf, more especially young bark without much cork on it; this outer skin having less of the proper sap or juice, and being much drier when taken off, will weigh less, and consequently will not be so valuable.

If possible oaks should be barked by the middle of June; but this, when there is a great extent to be cut, may be impossible, though it is equally disadvantageous to the proprietor and purchaser to cut and peel after that time, as every ton of bark taken off after the 1st of July will be deficient two cwt. per ton, compared with the same quantity taken off in May, or early in June.

The time of cutting is generally fixed for the 15th day of July, and after this date there should not be a single stool of oak wood cut that is intended for the growth; and as soon as possible after the 15th, the whole of the wood and bark should be carried away, that the young growths may not be disturbed or injured, as at this time they will have made considerable progress; at any rate there should neither be wood nor bark remaining within the new cut hag after the 1st of August; nor should either horse or cart be permitted to enter it after that period.

I know the time allowed for cleaning and clearing out woods, and removing wood and bark, is generally extended to Martinmas, and sometimes even to Candlemas, and where there is much to be done, it can scarcely be completed before Martinmas, 11th November.

It would be advisable for the proprietor to assign some spot of ground in a corner of the wood, or what would be preferable, some place distinct from it, to the purchaser, in which he shall stack up the bark, if it be determined that it should remain for any length of time after cutting; to this place also he ought to remove the wood,—for as I have already said, these remaining on the ground will be apt to disturb and injure the young growths. It is well known that trees, and oaks in particular, after the beginning of August, make what is termed a Lammas growth, and the future prosperity and health of the coppice in a great measure depend on the first year's growth, as far as regards form and vigour of the shoots, as will be shewn in Section IX.

Let it be carefully kept in mind, that as soon as the wood and bark are removed from a natural wood, that the fences should be thoroughly repaired, to prevent sheep and cattle from entering; and, even after the time of cutting, particularly after the growth has made its appearance, horses should not be allowed to go at large in it, while brought there for the purpose of removing the wood and bark. It is a well known fact, that cattle, sheep and goats, do more damage to young plantations, and more especially to young natural oak woods than can well be imagined or described. One would think that those who do not keep cattle of every description out of young natural oak woods, do not wish to see them thrive. After the 1st of August, when the cutting shall have been finished, and it is proper, as before stated, it should be so, the gate should be locked and the wood as completely secured as a man would his desk, into which he had put his money, to preserve it from thieves.

It is difficult to say at what time cattle should be permitted to enter these woods to pasture. Some have stated five years as the proper time, others eight; I, however, differ from both. I have no hesitation in saying they ought not to be put in till the natural wood shall have attained fifteen years, for the above reason, among many that might be stated.—I suppose, as I recommended, that all blanks which occur in the coppice, are filled up with young oaks, or if none have been planted, still there are seedlings springing up, which may come to be fine trees, and which ought to be preserved. In natural wood of old standing, there is generally a quantity of what is termed, in Scotland, black or barren wood, (such as ash, plane, birch, elder; &c.) and these are often not cut until after the oak is all cut and barked, and cutting and removing it from among the young growth of oak wood, it does more damage to the new cut hags than they are worth; it is in truth a practice destructive and awkward. Here the purchaser makes use of an excuse, and throws justly all the blame upon the proprietor himself. "Why, yes," says the purchaser, "I know it is the source of much injury to be cutting and removing the barren wood, after the oak growths have made such progress; I bought it and must have it out; this wood was not exposed to sale till late in March, (or April, as the case may be;) I did not become the purchaser sooner, and it is impossible I could have it all cut down before the oak was ready for peeling; and during the time of cutting and barking the oak, from which I am to derive the principal part of my profit, I could not attend to it." He will argue, if there be any part of it more particularly valuable, "It was not then the season for cutting wood of this kind; that it ought to be cut early in the spring or autumn, and the thing must be done whatever destruction it may cause: I am perfectly aware I am bound by the articles or conditions of sale not to injure the young shoots, but here is a large stool of five or six ashes, elders, &c., surrounded on every side by fine stools, and these have five shoots, some of them two or three feet long, but I must have thence this ash, &c. and I must have a fall to it. I cannot take it on my back as it stands, and carry it out of the wood."

The purchaser sets the cutter to work, he fells one, it falls right into the midst of an oak stool, and breaks off all or the greater part of the shoots; another falls in an opposite direction, does the same, and so on till the barren wood trees shall have destroyed as many, if not more, fine oak stools than all their value, and which most probably make all that cutting a mere blank.

To remedy this evil the proprietors of natural woods, who intend to sell, should put the woods to sale, if possible, in January or in February at the latest, if that cannot be done, in autumn, binding the purchaser to cut down all the black or barren wood, before beginning to the oak; and to have it carried off along with the oak and bark, giving him a reasonable time to fulfil his engagement.

This mode of selling natural oak woods, where the quantity of barren wood is great, can be attended with no inconvenience to the proprietor, for the price of bark is never positively known for the ensuing season, not indeed till some time in May; and in valuing these woods, either for sale or purchase, the calculation is made from the prices of the cutting and bark of the last season, unless some apprehension of a rise or fall in the prices or value is, from certain circumstances, to be expected to take place. An early sale is also in favour of the purchaser, and he will be inclined to give a better price, as he has sufficient time to look out for the most proper workmen, and has every thing in perfect readiness to commence the barking as soon as the bark will rise, and of course finish his barking in proper season. On the other hand, if he does not make the purchase until April, if he has 100 or 150 tons of bark to peel, he requires to procure 100 hands or more, and perhaps has to provide tools; and if the quantity be more than he is accustomed to have in his possession, before he is aware the season is advanced, he loses perhaps the first fortnight, and not unlikely the month of May has passed before he has proceeded any great length; he sees he must now hurry on, and gets confused; at any rate he is obliged to peel for a fortnight or more longer than he ought at the end of the season. In this case both he and the proprietors are losers. I would therefore recommend the sales of natural coppice woods at no later period than the month of February, particularly if there is barren or black wood to be cut.

SECTION IX

THINNING AND PRUNING NATURAL COPPICE WOODS.

This is a part of the forester's work that ought to command and occupy his most particular attention. The time to begin to thin these woods, say some, ought to be the third year after cutting, others say, five or six; and this is the most general time throughout the Highlands of Scotland, but particularly in Argyleshire, which abounds with natural woods, and beautifies, in a most superb degree, many sides of the barren mountains in that country, particularly about Inverary, and both sides of Lochfine, as also Lochlong. Some are not for thinning till they arrive at eight or ten years of age; but nothing can be more destructive and absurd than this. These newly cut stools, the very first year, that is to say, immediately after cutting (the same year), or as it is and may be called, the Lammas growth,* throws out of many of them ten and twelve different shoots, and some of them come up like a handful of grain thrown into good ground, or like a bush, covering the whole stool. This, say the advocates for ten year's growth before thinning, is nature's own work, and all should grow together for ten years, and then the thinnings will pay the expenses of thinning. Those, again, for thinning at three and six years growth, say that, as the tree when cut was in the most thriving and healthful state, the root retaining its sap, and having little to supply now besides what it formerly had, it, of course, is able to supply abundantly all the new young shoots that come out from it, and they ought to stand for at least three or more years, and then it will be well seen which is the properest shoots to live. I grant that it is nature's own work to throw out all those shoots from a newly-cut oak root, and I grant also that nature is ever kind to her own children; but nature may be overburdened, and she is effectually so in this case; and I say it is impossible for a tree-root, which is perhaps only ten inches in circumference, or say even twenty inches in circumference, and few are this size, to cherish or nurse up, with any degree of health or vigour, ten, or even twenty young shoots or trees, either to three, six, or ten years, without the tares spoiling the wheat, or the lean cattle eating up the fat, as the one must be evidently spoiling the other. Therefore every natural wood, the second year, should undergo a thinning, that is to say, it gets all the Lammas growth, as it is called, the year it is cut, and then allow it all the next year's growth, when, any time after, from the month of October to the first of April, let the whole wood be gone through, and clear or take away all the growths or young shoots, excepting those you are sure of coming forward to maturity, leaving, at this time, one or perhaps two shoots more on every stool, than what it may be supposed able to nurse up to the full time of cutting. Great care ought to be taken at this time to divide the shoots that are to remain so equally, that is to say, to have them at as equal distances from one another, round about the stool, as possible; at same time, not leaving on any stool, unless a very large one, and that too in an open part of the wood, more than six or eight shoots. This will be found to be as much as any stool can nurse up to the usual age for any purpose. By this early thinning, you have it in your power to leave just such a crop upon the ground, or rather upon your stools, as you are sure nature is able to cherish and nurse up, without overburdening it. At this early period of the thinning, too, you can do it easily, without in the least injuring the stools that are to remain, as it can be readily done with a short knife, cutting them off close by where they came out from the stool; and at this time, too, you have an excellent choice of shoots. By your being three or more years in giving the first thinning, you must have recourse to a chissel or pruning hand-bill; by which means, if in the hands of an inexperienced person, the proper shoots are often hurt; and besides, when taken off at this age, the bark is often loosened from off the roor, so that worms and other injurious animals get in betwixt the wood and bark, which sometimes proves fatal to the whole stool. I would therefore recommend early thinning, as I have found it, in the course of my experience, to be the very life of a natural wood.

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* All oak trees when young, but particularly when springing from the natural stool, advance with great vigour, and make every year two shoots, one in the month of June, and the other commencing in August, called the Lammas growth, which usually continues to grow till the frost stops it in the end of Autumn; and this is always the most valuable growth for natural oak coppice, and ought to be particularly taken care of.

All natural woods make either less or more progress the same year they are cut, that is to say, if the cutting is finished on or before the 15th of July. The stools cut in the months of May and June, make most vigorous progress. To give one example here, amongst many that might be given—I was engaged at an oak wood-cutting, in 1818, on the estate of Fotheringham, in Forfarshire. This was cutting from the plant, in order to turn it into a natural coppice-wood. We only began cutting the oak on the 18th day of May, and towards the end of July I measured three several growths, from three to four feet long, and by the middle of September from six to seven feet long. I grant those were very extraordinary growths, but I have often witnessed nearly the same in many other places.

And who would not say but that these should be encouraged, and allowed every chance of coming forward, by taking away at once all superfluous growths from the stools, and allowing them to get all the sap and nourishment possible? as it is well known that every green blade must be supplied with a part of sap or juice from the main root. Having thinned them the second year after cutting, little more will be necessary for some time, unless to go through and prune a little; at the same time keeping down all young suckers from off the stool. Here it may be very necessary to observe, that the value of coppice woods chiefly depends on the quantity of bark produced from them, and the more branches consequently the more bark; and some argue there should be no pruning at all. Let it be here observed, however, that the wood of coppice, properly trained up, at the age of twenty five years may be of considerable value; and its value chiefly depends on its tallness and straightness; because, if the timber of a coppice-wood, although thick enough for many purposes, if very crooked, is almost of no value but as firewood. I consider it, therefore, very advantageous for a coppice wood, to go regularly through it the second or third year after being thinned as described, and prune with caution all those shoots you think will remain to the full time of cutting, pruning them up from the root, and taking the most of the twigs off that side of the main stem that inclines to crook, in order that it may be drawn up in as straight a position as possible. This will be found to be of very great advantage to the cleanness, and also in aiding the straightness of the timber of a natural coppice-wood. Those stems you left when thinning, supposed to be taken out at half time or sooner, ought not to be pruned, but allowed to grow any way, and as rough as possible, taking, care, however, that they are not interlarding, nor in any ways hurting the main stem that you intend to carry up to full time. If you find any of them that were thus left taking too much of the juice or nourishment from the main stem, they ought instantly to be taken away, and see that there is no more left than what the main root is able to nourish up. I said two more may be left at this time than what the substance of the root will bring forward to full time;

but this will depend a good deal upon the soil, &c. &c. Having thus thinned during the second, and pruned during the fourth or fifth year, little more will be necessary now till the tenth or perhaps the twelfth year, when the whole should be gone over, by taking away those stems that were left as a kind of nurses to the main ones. Here it is difficult to say how many should be taken. Some stools may do with all the six, others with five, others with four, and some only with three. In the first place, care must be taken to leave no more than what you are sure the stool will nurse up to the full age intended for the coppice, as the stronger the stools become they always require the more nourishment. It will now easily be seen if any of those shoots are receiving sufficient supply of nourishment; if they are not they will become stinted in their growth. Those, therefore, ought to be taken away, and likewise those that are solely overtopped, and are not likely to get forward to any kind of maturity during the age of the coppice. In the second place, it will be necessary here, carefully to look round about the bottom of the stool, and if the stools are thick upon the ground, take the most from those sides that seem to press most upon one another. At the same time, it may be observed here, that a natural wood is not like single trees training up to maturity; they will thrive well although pressing a little upon one another, if it be not to hurt each other; that is to say, the one altogether overtopping or bearing down the other to its hurt; but they are the better for being a little pressed sideways, as it has a tendency to cause them grow more upright, and of course more straight. The thinning we are now attending to ought to be done in the barking season, and the bark peeled off what is cut and preserved. This will be found to do something more than pay the expence of thinning. Being done, however, at this season, the bark of the remaining shoots will be very easily hurt, as also the bark of the stool; therefore, the greatest care is necessary, that neither of them be injured. I have always found it here of the greatest saving, in place of an axe to use a very narrow-ended hand saw, one that will go in betwixt the shoots, and cut the one to be taken away easily out, without in the smallest degree injuring either the bark of the stool or the remaining shoots. If the saw is kept in proper order, it will be found more speedy than the axe. I have often found it of great use to go through a neglected coppice wood, one that had never been properly kept, even at the age of twelve or fifteen years, and dress it up in the manner described, and have been very sensible of their making more progress in one year, after having been thus dressed up, than before they did in three. So that I would recommend to all those having the charge, or coming into the charge, of natural woods, although they have been neglected until they are at the age of even fifteen years, to go through them in the way directed; and I doubt not but what they take out will pay more than the expence attending it; and I am convinced, that at the end of twenty five years, say ten years after, they will have a third, or nearly so, of more bark on every acre, and the timber will be considerably improved and of much more value. It has been objected to by those advocates * for ten

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* The natural woods in the Torwood, in Stirlingshire, is of very ancient date. The *Upper Wood*, as it is called,

years, before any thinning take place; that to do it any sooner would cost a great deal of expences, and nothing for it, whereas now it will pay the thinnings;—the advantages of early thinning has already been pointed out, which answers this query. The expences of the early thinning is very trifling. I have had a man under my charge that has thinned regularly every day upwards of 150 stools, or about 1000 in a week. Now, say the stools are about, or nearly, eight feet distant from one another, which they ought to be, a man does an acre in a week, for which perhaps he receives fifteen shillings; now the next thinning, at half age, or thereabouts, of the coppice, is so very superior to what they would have been, had every thing been permitted to grow, that this thinning pays itself and the former

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the property of Colonel Dundas of Carron-hall, was (until about fifteen years ago, when Mr Alex. Mills got the charge of it,) like a wilderness, and many acres of fine natural woodland would not produce one ton of bark; but, by Mr Mills' exertions in carrying on a system similar to what is here laid down, these very acres, by cutting-time, will, on an average, yield from five to eight tons of bark. The manner that these woods under his charge are thinned and kept does him much honour, and is worthy of the forester's imitation.

thinning with interest, and the wood is 25 per cent. better at the end. By the system of late thinning, I have known many stools irrecoverably lost.

SECTION X.

OF CONVERTING A COPPICE INTO A STANDING OAK WOOD, AND OF LEAVING RESERVE TREES IN IT.

It has been, and still is, an objection with many, that when a wood is once cut over, and become a natural coppice wood, that it must forever remain so, as nothing more can be done with it, but to cut it over every twenty-five years, or thereabouts; and should a time arrive when there is no great demand for oak-bark, this wood must at all events be cut down, and brought into the market under such disadvantageous circumstances, both as to the prices of bark and of wood, as may occur. But this is false reasoning, as there is scarcely any soil that carries natural oak wood to the age of from twenty to thirty years, but will also carry trees forward to full maturity, if rightly dealt with for that purpose. If it be, therefore, thought proper, either from the local situation of the wood, where it would be more profitable to have full-grown timber, or if it were even for ornament, to rear them up from the stools to maturity ;—supposing the stools have been dealt with as directed in the foregoing section, to the age of twenty-five years, or thereabouts, and it being thought now more advisable to bring as many of them as possible to be large trees, it will then be necessary to cut over about a third part of the whole stools, and at same time dressing up the stools as directed for the growths, then thin out from the stools untouched, which will now be about 24 feet distant from each other, taking the worst of the shoots, leaving on an average at least three shoots on every stool, and these must be the best and healthiest of the shoots or stems; at same time pruning them up with particular attention, taking most of the sprouts from off the inside of the stems of the remaining shoots, pruning them up from the middle of the stool towards the top. They having now plenty of room to spread out on all sides, will do so with amazing rapidity. As the under coppice cannot be expected to make such progress as when the whole is cut down—it will be also necessary, the second year after cutting, to thin those stools, so as to leave from six to eight shoots on an average on each of them, allowing them to grow in their rough state, without any pruning, as they must now be cut away every fifteen or twenty years, chiefly for the bark. At the first cutting off of the under coppice wood from amongst the large stools, as they will now have made very considerable progress in size, they will require a little more room, and may be at the time, say fifteen years after being left, when the under coppice is cut, thinned out, till about 30 feet distant from each other. This is by far the most profitable way of rearing oak woods.

In order to have large trees in any plantation, they must be thinned out to at least 30 feet distance from each other; and here, on an average, you have only about sixty trees on an acre; whereas, from the natural shoots you have three times that number, and their growth is much more rapid than from the plant. In this case each acre of natural oak trees, nursed up to 70 years of age, will contain about 180 trees, which will average at least 30 feet each tree, making 5400 feet, say at 4s. per foot, including bark, (which is but a low price for such trees) makes L.1080 Sterling, per acre, or upwards of L.15 per acre, per annum, besides all the under coppice-wood, which will all along have done a great deal more than pay a fair rent for the land. Some will be ready to object, and say, that trees will not grow to these sizes, three out of one stool, within the compass of 30 feet. I could here give many instances of this that have come under my own observation, but the following may suffice, which must have commanded the attention of every traveller; and every one who is delighted to see the bulwarks of our nation in a flourishing state, must have stood still to admire it. This oak stool I refer to, is on the estate of Touch, in Stirlingshire, and grows close upon the public road-side leading from Stirling to Dumbarton, between four and five miles from the former place, where there is to be seen three trees growing from one stool, the least of which contains about 40 solid feet; the three added together, making on an average upwards of 150 feet, and does not occupy more than nine feet of ground any way, and this natural stool of oak is not more than from 70 to 80 years of age; on the opposite side of the road, at the same place, is a single oak tree from the plant which I am informed was one of the reserve trees in that coppice. When this stool was cut, it must have been of very considerable size at the time, as the tree does not measure more than half the contents of the natural ones put together, and occupies a great deal more ground than they do. There are a great many more natural oak stools on the same estate, near the house, not much beyond half the age of the above tree, that has three, four, and five stems from them, and will average 30 feet each stem.

Allow me to give one more instance.—There is a natural stool of oak on the farm of Bareside, estate of Touchadam, the property of William Murray, esq. This stool has seven stems growing from it, one of these stems, which has been over-topped by the others, on account of their never having been properly pruned up; has become dead, though there is still about three solid feet in it; the other six stems are really, each of them, large and magnificent trees;

and on account of their having been left entirely to nature's own care in rearing, their main stems are extremely short, besides what they might have been, had they been timeously pruned up, but they are remarkably well adapted for ship building, and each of the six stems would make timbers and knees for a vessel of from 160 to 180 tons; the six stems put together measures no less than 180 solid feet; and as there is more branches on this stool, in proportion to its measure, than on the one before alluded to on the estate of Touch, of course, it will produce more bark in proportion to the number of feet. It may be observed that from the valuableness of the crooks of this stool, it is well worth 5s per foot, including bark, which, for 180 feet, is £45 sterling. From the way that the stems of this stool has been obliged to spread, it covers a great deal more ground than the one referred to, yet an acre of ground would be very capable of carrying 40 such stools as this, which would be no less than L. 1800 sterling per acre; and, I am informed, this stool is not more than 75 years of age; this is no less than L.24 per annum, per acre; and I have no hesitation in saying, if my information is correct, that, from the poorness of the soil of this farm, two acres of the under coppice woods would have paid the proprietor annually, all the rent he has received for this whole farm for 70 years past. This magnificent stool of oak grows not more than a gunshot south of the public road leading betwixt the villages of St Ninians and Cambusbaron; and, at that distance, it only appears in the eyes of the traveller to be a mere bush, though its large spreading top appears most beautiful; but how pleasingly deceived is he when he approaches within the cover of its spreading branches, and beholds, not only a bush, but the principal timbers of a large ship, and that too one of nature's own children, nursed by herself, as it is plain no attention had been paid to the rearing of it, and that too from the bare soil of Bareside farm. It is customary to leave standers or reserve trees amongst coppice, but when it is intended all to be cut over, it is rather hurtful than otherwise to the under growths, it may, however, sometimes be necessary, for the sake of ornament, &c. to leave a few of these, and these ought to be of the straightest trees, and, at the cutting of the coppice, *they ought* to be particularly pruned up, especially if those left are seedlings, or from the plant; and the tops of them ought to be a good deal lightened, so as the wind may not blow them down, nor shake them too much, so as to loose them at the root, as it causes them lose the growth, which is often the case if they are left in very exposed situations. It is very proper in all coppice-woods, to reserve, from cutting, all young seedlings at and under four inches circumference, three feet from the ground, as those will come forward to be good trees by next cutting, and may perhaps supply the place of old stools that have been hurt in cutting, or that may be on the decline from some other circumstance.

After giving these two examples amongst many more that might have been given, the reader will readily see, that it is not only a very easy process to turn a natural coppice wood into large trees, but that it is the speediest way of rearing oak trees, either for valuable purposes or for ornament.

SECTION XI.

TRIAL OF A NEW METHOD OF THINNING NATURAL WOOD.

This new method is founded on an experiment I made in 1810. At this time I tried only six stools of oak which I particularly marked in the wood; I visited them every year regularly for four years after, and found them doing extremely well. I saw them again in 1819, nine years after the experiment, and I found them doing equally well to the best stools in the coppice, and far superior to a great part of it. I have, every year since 1810, tried the same experiment with less or more in number, and have all along found it to succceed extremely well, and in many instancess far outstripping any stools in the rest of the coppice, and they had no occasion for the least thinning, nor the least attention being paid them; but I have not yet lived to see a second cutting of any of them, nor am I as yet perfectly assured whether or not it may not be detrimental to the root or stool after next cutting, although from their healthy like appearance, now nine years after, I hope not. I shall submit the experiment to the reader, and those managers of woods who have it in their power to make trial of it, and should it succeed, it would save a great deal of expence and trouble in training up coppice woods.

The plan is this:—immediately after the tree was cut, and the stool dressed up, I went through and selected a few stools, for the purpose of trial. The first stools I pitched upon in 1810, were cut from the plant, and the diameter of the least was eight inches, and the largest not above twelve, making 24 and 36 inches in circumference. These stools I divided some into eight and others into twelve parts, and with a peeling iron I took off, from some four, and from others six parts of the bark, pulling it down below the earth, and taking it completely off the root, taking care not to loosen the other four and six parts of the bark from the root, but leaving it perfectly entire, at equal distances round the root; and from every one of these stools which I have tried in the way described, less or more every year, for these nine years past, and not one stool out of ten but what has sent up fine healthy shoots from that part of the stool where the bark was left; and many of these stools I can at this day point out in the most thriving condition; nor have they ever required thinning, as they just throw out such a number of shoots as there are pieces of bark left on the stool: and I can add here, that I have tried the main bodies of the stools, and have found them to be as full of sap as those stools having all the bark left on them. Should this method succeed in after-cuttings, of which I have now little doubt, what a vast improvement it would be, and what a saving! One man going after the cutter, could prepare at least a hundred stools every day, and the wood would require nothing more till once it came to the axe again.

I hope these few hints, which are dictated by experience, will induce an early trial to be made by those who have it in their power, as nothing can be lost by it: for, at first, the trial may be made in stools, which it does not signify much whether they are lost or not. Those taken should be such as are in places where they can be spared —but, at same time doing it justice, by using a thriving stool.

SECTION XII.

TO EXTIRPATE BARREN WOOD FROM OAK COPPICES.

The natural woods of old standing, used very much to abound with what is called barren wood, such as birch, elder, saugh, hazle, and the like; and, indeed, great quantities of these are still to be found on good land, perfectly capable of carrying fine oak.

About eight or ten years ago, when oak-bark was selling at from L.18 to L.20 a ton, the proprietors of oak woods began to see the advantage and propriety of having, if possible, all their natural woods of oak, and where what is called the barren wood was growing, it was extirpated, or kept down, and oaks planted in its place. The only way of keeping down these kinds of woods was, every spring, before the growth was far advanced, men were put through the woods with axes, and made to cut off all the shoots that had made their appearance during the preceding summer; and this had to be repeated annually during half the age of the coppice, which was a laborious work; and, even after all this, many of the young plants were choaked with this kind of stuff; and besides, it never was fairly rooted out or extirpated. About eight years ago I fell upon the following plan, which, in my experience, and the experience of every man who has followed it, has been found to answer the purpose most effectually.—The plan is this:—if you have any of those trees which you want to extirpate, let them be cut in summer, when the sap is in them. You may do so along with the oak, or at the time of peeling. After being cut down, either with an axe or otherwise, a person must be sent through with a peeling iron, and made to peel all the bark off round and round the root, considerably below the surface of the earth—to the bottom of the root or stool, if you can; and the iron will easily do this; at any rate, be sure it be taken off all round the root, and completely under the surface of the earth; and this, if properly done, will be found effectual, and that, too, once for all, for it will require no more work to keep it down; as all further growth or vegetation in the shoots is, by this plan, effectually checked.

I could mention many woods where large quantities of birch and elder, and other woods, have been extirpated from amongst oaks in this way; and the expence of doing so at the time is very trifling, and then it requires no more work to keep them down afterwards, as they are, in this manner, as already stated, effectually destroyed.

SECTION XIII.

OF VALUING STANDING OR GROWING TREES AND WOODS.

Having now finished, in as brief a manner as possible, what I intended to say on thinning, pruning, cutting, and training up, young plantations and coppice-woods, which I hope will, in the meantime, be found sufficient for that part of The Forester's Guide, (although I may afterwards enlarge upon it) it will be now necessary that I lay down before the forester, to complete his guidance, the manner and method of valuing coppice-woods at all ages, as also, of measuring and valuing standing or growing trees, of all kinds and sizes; and this being a subject on which none that I have either seen or heard of have either written or said any thing upon, I must be excused if I should exceed a little the limits at first prescribed to this work, as I must be here somewhat particular. It will be necessary, in the beginning, to give a brief description of the kinds of timber used for most particular purposes, and of course bringing the highest prices; and in this, as in the other part of this work, I shall use only such names for the different kinds of wood as are understood and used throughout Scotland, so that every person, in the least connected with the selling of woods, or working amongst them, may easily understand me.

A plan will be found at the end of this part of the work of my newly-invented instrument for measuring standing trees, with an explanation of the manner of working it, whereby any tree, with its branches, can be measured as accurately and expeditiously as if it were lying on the ground, whereby a difficulty of a very serious nature, and of which I myself have often been an eye-witness, is completely removed; that is, I have often seen a ship builder apply to a gentleman for a particular tree, or trees, say for a keel piece, the gentleman sends him to his forester, and desires him to give him any tree or trees, out of such or such a part of his plantations, as will suit his purpose, for which he is to pay a very high price; well, the carpenter knowing he is to pay a very high price, wishes to have the tree or trees he requires as near the sizes as to length and girth as possible, not to have much waste of wood, as he knows he is liable to pay for the whole measurable timber which it contains. In search of this tree or trees they go through the plantation, backwards and forwards, till perhaps it is near the evening; they now fix upon one or two trees as is required; and two or more men with saws and axes, who, either at the proprietor's or carpenter's expence, has followed them all this time, set to work, cuts down one, it is girthed and measured in length, well it is too small at the top, a second is cut down, it is the same way too; says the carpenter, "They may well do, if a little too large, but they cannot do too small or too short." He, as I said before, again to save money, and to get them as near the sizes as possible, still cuts, till he has perhaps cut five. six, or eight trees, before he gets one or two to suit his size; therefore, although the proprietor gets 4s. or 5s. per foot for one or two of those particular trees where is his profit? The carpenter puts him off with a plausible story, saying, "I will likely require these others next year for a smaller vessel, and I will give the same price," whereas, they are allowed to lie on the proprietor's hands till a merchant casts up for them; but before this occurs, the trees begin to spoil, and he must now sell them for purposes not so valuable, rather than lose them, perhaps receiving only half-price for them. I have seen cases of this kind even more than 50 times; and I have myself often been authorised by gentlemen to give a particular tree or trees, for especial purposes, both in machinery and ship-building, and have been deceived in the manner just described. Now this newly invented instrument for measuring standing trees removes all these difficulties, as with it you can take the exact length and girth of any tree, either at the extremity or any part of the body of the tree, with the same exactness as if lying cut on the ground, besides, if the proprietors of woods chose it, they could have all the large or full grown trees in their plantations, or in any part of them, numbered, and their measurements accurately taken and set down in a book ruled for that purpose; so that a gentleman at London, abroad, or any where at a distance from his estate, carrying with him a book in which was the dimensions and measurement of these trees, and should it so happen, that at any time he should require a little money over and above his usual income, he can turn up his wood book, in which he has the number and measurement, and of course the value of all his trees; he can then pick out such a number of trees, and these numbers remitted to his forester or manager, with instructions to sell them, and he at same time strikes them out of the list, and he knows at once the exact sum, or nearly so, he is to receive for such trees; and, besides, should any tree or number of trees be blown down, or broke, or lose their growth, &c. the forester, or wood manager, writes, sending a list of the number and measurement of the tree or trees thus blown down, &c.; he at once turns up his wood book, and sees the tree or trees and their value. A book kept by any proprietor of woods of this kind must give universal satisfaction; and, by having in readiness on their estates this newly invented instrument for measuring standing timber, which is very easily acquired, being so very simple and cheap. Admitting their plantations are all young and thriving, and yearly on the increase, they can very easily and expeditiously be measured over as often as need requires; and should a gentleman require to cut only a few trees from his own woods annually, for purposes on his own estate, when he knows the sizes required, he can easily, before cutting, know the very tree or trees that will suit the various purposes required.

The author has prepared a book ruled on the above plan. In this book, nothing is required but to fill up the blanks in the different columns, stating the sizes of the trees. A book which may contain the measurement and value of 5000 trees, may be had of the author for a mere trifle.

SECTION XIV.

OF PRINCIPAL PIECES OF TIMBER USED IN SHIP BUILDING.

The principal pieces of timber used in all kinds of ship building, whether large or small, are nearly of the same cast or shape, as they are all built of nearly the same mould, but these differ very materially in point of size; for instance, a small vessel of about 40 tons register will require a keel nearly 40 feet long, and to square about 8 by 11 inches, whereas a vessel of 80 or 100 tons register, will require a keel about 60 feet long, and to square about 10 by 12 inches, and so on, the other timbers in proportion. It is perfectly sufficient for our purpose here, that I inform the forester of the names of a number of the most particular pieces of timber used in a vessel, and for which, when asked for singly, are known to sell highest, and are, on that account, the most valuable. First, there is the outer keel, this is commonly used of beech or elm, and made generally of two or three trees or pieces joined together to whatever length is required, these are looked for to be nearly straight, and sell generally according to the length of the piece, at 3s. 6d., 4s., and 4s. 6d., and some years ago as high as 5s per solid, or cubic foot.—Second, the keel stone, or inner keel; this requires trees of nearly the same description, but are chiefly made of oak; these I have often sold as high as 7s. and 7s. 6d. per foot, during the late war.* Third, floor timbers; these are sometimes used of elm and beech, and are a little crooked, generally sell at 2s. 6d. per foot. Fourth, first crooks; these are a good deal crooked towards the one end, as they begin to ascend up the vessel, and are more valuable than the floor timbers but are also used sometimes of elm and beech, and generally sell, when asked singly, at about 3s. 6d. per cubic foot. Fifth, upright

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[*] Let it be understood, that since the peace, there is so much of beech, elm, black birch, and oak, comes in from America, which is applied to the same purposes, that it has greatly reduced the prices of this kind of timber, although it is allowed, on all hands, that the American timber is not near so good. Still it has brought the prices of our timber of that description down 1s. per foot from what it was formerly.

timbers; these are always made of oak, and are considerably crooked, and these sell, when asked singly, at 3s. 9d. per foot. Let it be here observed, that elm or beech is seldom put into a good vessel, except the lower part, where the vessel is always under water when light. Sixth, top timbers; these are also of oak, but not so valuable, as they are mostly straight, and although asked singly, only bring about 3s. per foot; keeping in view that the feet used here are solid or cubic feet, line measure, 1-4th of the girth taken for the side of the square. Seventh, beams; these go under the deck of the vessel, and are also all oak, and have but a small crook, but require trees of considerable length, and are valuable, say 3s. 6d. and sometimes 4s. per foot. Eighth, knees; these are always of oak, and are the most principal crooks in the vessel, and when these are asked for singly, they generally bring about 5s. or 6s. per foot, according to their sizes. Ninth, stem-piece; this is a very particular crook, and when asked singly, generally sells at 4s. 6d. per foot. Tenth, breast hooks; these also have particular crooks, and sell at 4s. and 4s. 6d. per foot. Eleventh, stern posts and windlass, are straight pieces, but when asked for singly, sell at 4s. per foot. Twelfth, trees that will cut up for planking; these are used of as great a length as they can be got, and are the better of having a considerable crook or curve one way; these are used of elm or beech for planking under water, and sell from 3s. to 3s. 6d. per foot; but four planks of oak are required for one of beech or elm for this purpose, and if oak, they commonly sell at 4s. and 4s. 6d. per foot.

These are the principal pieces of wood used in ship building, that are of the most value, when asked for singly,—but prices will vary a little as circumstances or the demand occurs.—But when a large promiscuous lot of oak or any other timber, say large and small, crooked and straight together, are sold to a ship-builder, he generally pays what is called an average price for the whole, say from 2s. 9d. up to 3s. 6d. per foot. It is worthy of observation here, that the most valuable and by far the greater part of timber used in ship-building is crooked, it is therefore greatly for the interest of the proprietor, that the forester attend to make his trees grow as crooked as possible; for this purpose he may consult Section II.

SECTION XV.

PRINCIPAL TREES MADE USE OF IN MACHINERY.

Since the making of cast iron and malleable iron came to such a degree of perfection in Britain, it has greatly reduced the quantity of timber demanded for mechanical purposes. The prices of cast and malleable iron has been so low that it is applied now to many purposes in which timber was formerly used, besides a great many of the large gun carriages both on board of ships of war, and also in land service, were formerly made of the best of oak, elm, and ash, but are now chiefly made of cast and malleable iron.

The principal kinds of timber in use for mechanical purposes, are oak, elm, ash, and planetree, oak is used for mill wheel axle-trees, and when required for this purpose, must be of a large size, and of good quality: and a tree for this purpose usually sells as high as from 5s. to 7s. per foot. The arms too of a mill wheel are

cubic feet." He also adds, "
of course, take 2,000 large well-
timber trees, of nearly two tons
supposing these trees to have
at the distance of thirty-three
from each other, the distance
should stand at in a plantatio
such trees, each statute acre
contain forty trees, consequentl
building of one seventy-four gun
would clear, of such woodlands,
timber of 50 acres." This quantit
certainly very great, and, of cou
an equal proportion will be requir
according to the size, from a cutte
a three-decker.

Supposing all the waste land
Scotland, which, by the report
committee of the Board of
culture, amount to no less
14,218,224 acres; and suppos
this to be covered with full-grow
timber, it would prove ver
quate to replace the British

when bought for
3s. 6d. to 4s. 6d. per
bout cast iron found
which sells at fro
purpose. These are
inds of hard wood
when asked for si

sometimes used of oak, elm, or ash, which sell at 4s. and 5s. per foot;—the ring of the wheel is sometimes of ash, planetree, or saugh, and when crooked to answer this purpose, generally sells at 3s. and 4s. per foot. The buckets of the wheel are either made of saugh, (which is the best) or of fir; when saugh is asked for this purpose, it generally sells from 2s. 6d. to 3s. 6d. per foot. Whatever inside machinery about a mill is made of wood, it is most commonly of oak, elm, ash, plane, or sometimes beech, and when asked for those purposes, generally sells at from 3s. to 4s. per foot, according to the largeness of the sizes that are required. Large planetree is often asked for, which is used both in printing and bleaching works, called beetling beams, a kind of tree that was very difficult to be obtained, and often sold at a very high rate. It is necessary this should be a tree that would work to from 18 to 24 inches diameter, perfectly clean and straight. Trees of this description, when asked for singly, always did, and will, sell at a very high price, for I have often seen paid for them, when bought singly, from 7s. to 8s. per foot. Large planetree is used also for mangle or calender soles; when bought for that purpose, it brings from 3s. 6d. to 4s. 6d. per foot. Planetree is used also about cast iron foundries, for making patterns, &c. which sells at from 3s. to 4s. per foot for that purpose. These are the most of the particular kinds of hard wood made use of for machinery, and when asked for singly bring the highest prices.

SECTION XVI.

PRINCIPAL KINDS OF WOOD MADE USE OF IN CARRIAGES, HUSBANDRY UTENSILS, &c. &c.

UNDER this head we may class waggons, coaches, and carriages, of every description, as the same kinds of timber are used in the whole of them.

The principal description of timber used for carriage wheels of every kind, is elm for naves; oak for spokes; ash, elm, (and some use beech) for fillies. Elm, when required for coach or carriage-wheel naves alone, sells from 3s. 6d. to 4s. 6d. per foot. Spokes are what is generally termed blocked before they are sold, and they are generally blocked out of small oak trees, for which purpose the oak timber of natural coppice-wood is remarkably well adapted, and these are used at various lengths and sizes, according to the height and strength of the wheels. Chaise wheel spokes, long and short, taken together, sell at 40s. per long hundred, say 120 to the hundred, or 8s. 6d. per gang, of 26 spokes to a gang. Spokes for common-sized cart-wheels, sell nearly at the same price, and in the same way. Ash and elm for fillies, at 3s. and 3s. 6d. per foot, and beech at 2s. 6d. per foot. The principal part of timber that is used in coach making, and when it is found to answer for poles, perches, or splinter bars, &c. and purchased singly for that purpose, sells at from 4s. to 4s. 6d. per foot.

Ash is chiefly used for plough beams, and cart trams or shafts, and it commonly sells, when asked for that purpose, at about 4s. per foot.

The common carters and carriers in Edinburgh, Leith, Glasgow, Greenock, &c. prefer using for their cart-sides or trams young oak trees, such as one whole tree to work into a side or tram, and when these are got good and suitable for their purpose, a very high price is paid for them, from 4s. 6d. to 6s. per foot.

Ash and elm are used for harrow bills; but when large birch wood can be got, capable of being cut into planks for that purpose, it is used in preference, and makes excellent harrows, much better than either ash or elm, as it is of a more tough nature, and not so subject to split either with the drought, or in driving the iron teeth into it.

SECTION XVII.

THE PRINCIPAL KINDS OF WOOD USED BY COOPERS.

SINCE the British Parliament authorized herrings to be put into barrels made from British timber, and gave the same bounty for herrings cured in these barrels, and allowed them to be exported, which formerly was not allowed unless the barrels were made of foreign oak, ever since that time, large quantities of alder, birch, and small hard wood of all kinds, have been cut up for this purpose: and since circular saws have become so plentiful through this country, which is a most excellent and expeditious method of sawing up small woods, and particularly into herring barrel staves, the prices of small woods for that purpose have become somewhat considerable; hence it is that plantations, many of which are to be met with in the Highlands of Scotland, consisting almost entirely of birch and alder, and which, in former times, were considered of almost no value, and were chiefly cut for firewood, have of late been sold for considerable sums of money; and as circular saws require very little machinery to erect and set them a-going, and when a place can be found for them near a plantation of this kind, it of course enhances the value of the wood very much, because, after it is cut up into staves, &c. it becomes very portable and easily carried to seaports although the plantation should be a considerable way inland, and the brock or brushwood that comes from the saws can be sold to good advantage in an inland country where coals is so scarce and valuable. These circular saws cut up immense quantities; one saw, drove by a 4 horse power, (either by water or otherwise,) when wrought, and attended to by three or four men, will cut up one thousand barrel staves each day. But observe here, that the 1000 bsrrel staves are 1200, it being the customary way of selling them by the long hundred. Some will be ready to say that these saws, cutting up such large quantities in one day, and when there are now such numbers of them at work in the country, that they will soon over-stock the market, but let it be here remarked, that the quantities consumed annually are immense. I have it, from good authority, that at the port of Leith alone, there are used annually of herring barrel staves, upwards of *ten hundred thousand;* in Greenock, Port-Glasgow, and Glasgow, as many; the like number about the Western Highland Lochs; Burntisland, Dunbar, and the coast of Fife, including Dundee, an equal number; and in the northern counties, say from Aberdeen to Wick, a great deal more than 1,000,000. So that there is no fewer than five millions of staves used annually, which must take an immense quantity of wood; but no small portion of this is made from American hardwood, both at Leith, Greenock, and Glasgow. As this is an article that is likely to continue in demand, and as beech and elder wood will grow and thrive in marshes, when no other kind of wood will, such gentlemen as have a quantity of land of this description, would do well to plant it with wood of the above description; and as it grows very rapidly from the new cut stock, and does not require much care or attention, though to do it justice, it should have a little in the same way as the natural oaks, it will be perfectly ready and fit to be cut for stave wood every 15, or from that to 20 years. A piece of ground which is hardly fit for any other purpose, may, in this way, be turned to very good advantage. There is no danger of the want of demand for staves, while government continues to give the bounty for herrings put into barrels made from British timber. The consumer of staves generally requires that they should average four inches broad, but they are used from two to six inches broad, and thirty-one inches long, so as to work in the barrel, when finished, half an inch thick. Staves of the above description, (say in general averaging four inches broad,) sell, at the port of Leith, &c. or where they are used, at about L.6 sterling per thousand. Sixty square or cubic feet of timber well cut into one thousand staves. Wood bought for the purpose of cutting into staves, if near a seaport, where it can be readily carried to a market, sells at 1s. per foot; the purchaser being at the expense of cutting, carriage, &c.

Small planetree is also used by coopers for herring barrel ends, and is very easily cut up for that purpose with the circular saw. When cut for this purpose, there is no matter what the length or breadth be, but the thickness must be ⅝ of an inch after being finished in the barrel, and when cu tup and sent to market with the staves, sell at two-pence and two-pence half-penny per superficial foot, or nine-pence for as much as will make a pair of ends, each to work eighteen inches diameter. When small planetree is bought in the woods for this purpose, and when near water carriage, it sells from 1s. 6d. to 2s. per foot.

As this is a new source of consumption for timber of the above description, I have been the more particular regarding this part of the subject, and I have only to add here, that if our American supplies were shut up, how soon would our home supply be exhausted of this single article, however insignificant it may appear as a species of timber?

SECTION XVIII.

THE CONSUMPTION AND USE OF WILLOW, OR OSIER, BY COOPERS.

Of osier, or hoop willows, there are a great many kinds, no less than eighteen; but it is sufficient for my purpose here, that I mention those kinds only that come soonest to maturity, and fit for making good barrel hoops. For this purpose I need only notice two kinds, first, the common osier, or hoop willow, and secondly, the Huntingdon willow. Either of these two kinds grow excellent hoops; and, if properly managed, are ready to cut, alternately, for that purpose, every three years. Having mentioned in the preceding section the immense quantity of staves made use of in herring barrels alone, it will very readily occur to every person, that the quantity of hoops used for making up such a number of staves into barrels must be immense, as every barrel takes at least 20 hoops. I have been informed by many of the most respectable of the consumers of this article, both on the east and west coasts, that barrel hoops are, for the most part, imported from Holland and England, whilst they admit that Scotch hoops are equally as good when they can be got. I have also been informed by some of those gentlemen who have themselves cut some plots of Scotch hoops, that although there were 5000 acres of land in Scotland, all bearing good hoop willow, and these cut alternately every three years, it would not be more than sufficient to supply the annual demand of this country. These hoops, after being split in two, sell in bundles of 120 in each, at from 4s. to 5s. per bundle. This is, on an average, 4s. 6d. for every 60 round hoops.—What a large quantity of these even a single acre would produce! I am informed there are many acres of hoop willow ground, in England, that pay an annual rent of L.10 per acre. I know several pieces of ground in Scotland, growing hoop willows, that pay annually a rent of L.6 per acre; and there is a small barn-yard in Stirlingshire, where there are about 100 stools of hoop willows growing from the side of a useless ditch, which have brought in regularly, during the tack, from L 4 to L.5 every three years. Sure I am there are many gentlemen in Scotland who have whole acres, and some of them many acres, of marshy places, capable of carrying hoop willows, which I believe they draw almost nothing for. These keep a gardener or forester, and they might, with very little trouble, turn a few acres, or even half an acre, less or more, to very good account in this way, as it requires very little management after being once planted. A few years ago, Hugh Baird, esq. engineer, proposed to the proprietors of the Forth and Clyde canal navigation, to have some parts of the canal banks planted with hoop willows, which I understand is annually going on, and will soon bring in to the proprietors of that navigation, a very handsome income, besides beautifying the banks.

SECTION XIX.

THE PRINCIPAL KINDS OF HARDWOOD MADE USE OF BY CABINET-MAKERS.

The principal kind of hard wood made use of by cabinet-makers is mahogany; but they sometimes make use of elm for chairs, beech for bedstead framing, planetree for common tables, and Spanish chesnut for boxing, drawers, &c. in the room of wainscot, holly, and sometimes limetree for inlaying. Elm, for chairs, generally sells at 3s. per foot; beech, for bedsteads, at 2s. 6d.; planetree, if large, for tables, at 3s. and 3s. 6d. per foot; Spanish chesnut, for boxing, at 2s. 6d. per foot; though Spanish chesnut is of much more value when suitable for ship building, as it is often used for that purpose; holly, for inlaying, 2s. 6d. per foot. Planetree is also used by block-makers, and sells, for their purposes, at 2s. 9d. The carvers and gilders use chiefly limetree, for picture and glass frames, and generally buy it for this purpose at 2s. 6d. per foot. Turners use chiefly beech, birch, plaintree, box, holly, &c—Beech, for their purpose, sells at 2s. 6d.; birch, at 2s.; planetree, 2s. 6d.; and box and holly, at 4s. per foot. Lock-smiths use chiefly beech and planetree, of which they use great quantities for lock stocks, which they buy at 2s. 6d. per foot. Last-makers use always beech for lasts, and buy it at 2s. 6s. They were accustomed to use beech for heels and patten stocks, when they were required, and bought it for that purpose at 2s. 6d. per foot. Large quantities of American black birch, and other kinds of American hard wood, has been adopted by cabinet-makers and other tradesmen, for many of the purposes mentioned, which has both lessened the value and demand for the hard wood of this country.

SECTION XX.

OF THE TREE WILLOW, OR SAUGH.

There are large quantities of this saugh wood used about cast-iron founderies, and particularly about coal or lime works, for cutting up into boards for cleading waggons, barrows, coal buckets, used below and at the coal pit mouth, and is very well adapted for this purpose, on account of its tough nature, and is by no means apt to splinter from the stroke of the sharp corner of a piece of coal or limestone, as any kind of fir timber; hence large quantities are used for that purpose. For the above purposes, either red or white poplar, or any other kind of saugh, is used. When near a sea-port, so as it can be easily conveyed to public works, sells at from 1s. 6d. to 2s. per foot. Sometimes limetree is also used for this purpose, and generally sells at the same price.

It would be an endless task to mention every article that hard-wood is applied to—but what has been mentioned is the most general and particular purposes; and when asked for, agreeably to the foregoing designations, will bring the prices mentioned in almost any place in Scotland, with very little variation, except in cases where a person is desirous for a particular tree; in this instance it may bring a price higher than any mentioned.

SECTION XXI.

AVERAGE PRICES OF HARD WOOD.

I SHALL now enter upon what may be considered as the average prices of hard wood for the years 1817, 1818, 1819, and the spring of 1820, at the ports of Leith, Glasgow, Greenock, Perth, Dundee, and Aberdeen, taking whole cargoes, from 6 inches in the side of the square, line or girth measure, and supposing the average square girth of every cargo and kind not less than 10 inches, and the quality good. Here let the reader always keep in view, that the prices mentioned are for the solid or cubic foot of round timber, line measure, and one fourth of the girth taken for the side of the square, after deducting an allowance for bark.

This observation on his part is the more necessary, as all English oak, or other hard woods, brought to any of the above ports, are all sided or squared a little, and sold by the calliper measure, taking the diameter of the piece the square, which makes a very considerable ference in the measure, and of course in price; but in this case we proceed by the measure, according to Hopus, as the stan measure of all kinds of timber, as I have d all along.

Average Prices at the Port

OF LEITH.

		per foot.	
Oak, - -	L.0	3	6
Ash, - - -	0	3	2
Elm, - -	0	3	0
Planetree, - -	0	2	9
Beech, - -	0	2	4
Spanish chesnut, -	0	3	0
Walnut, - -	0	3	6
Cherry or geen, -	0	2	6
Saugh, - .	0	2	3
Birch and alder, -	0	1	6
Hornbeam & laburnum,	0	2	3

AT GLASGOW.

	per foot.		
Oak,*	L.0	4	6
Ash,	0	3	6
Elm,	0	3	3
Planetree,	0	3	6
Beech,	0	2	6
Spanish chesnut,	0	3	0
Walnut,	0	3	3
Cherry or geen,	0	2	9
Saugh,	0	2	8
Birch,	0	2	0
Alder,	0	1	6
Hornbeam & laburnum	0	2	6

AT GREENOCK.

Oak,	L.0	3	6
Ash,	0	3	4
Elm,	0	3	2
Planetree,	0	3	3
Beech,	0	2	2
Spanish chesnut,	0	3	0
Saugh,	0	2	4
Birch and alder,	0	1	8

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* Let it be kept in view, that there is scarcely any oak sent here for ship-building, but chiefly for machinery; and, consequently, sells higher when suitable for that purpose.

AT PERTH.

		per foot.	
Oak,	L.0	3	0
Ash and elm,	0	2	9
Planetree,	0	2	6
Spanish chesnut,	0	2	6
Beech,	0	1	10
Geen,	0	2	0
Birch and alder,	0	1	0

AT DUNDEE.

Oak,	L.0	3	6
Ash,	0	3	0
Elm,	0	2	9
Planetree,	0	2	6
Beech,	0	1	10
Spanish chesnut,	0	2	6
Saugh,	0	2	4
Birch and alder,	0	1	2½

AT ABERDEEN.

Oak,	L.0	3	6
Ash,	0	3	9
Elm,	0	3	6
Beech,	0	3	0
Planetree,	0	3	3
Beech and alder,	0	2	0
Cherry or geen,	0	2	6

Let it be observed, that these are the prices when a complete cargo or large quantity is taken, for when sold by retail, or in small portions, they bring a much higher price.

The average of all kinds of timber were much higher, at least a shilling per foot, at all these places, during the late war, compared to what they are now.

SECTION XXII.

ON THE PURPOSES TO WHICH SCOTCH FIR TIMBER MAY BE APPLIED.

Were the common Scotch fir, which is so congenial to the soil and climate of this country, permitted to arrive at the same age with foreign timber of the same kind, it would prove in every respect equally valuable. Were the Scotch fir allowed to stand on the ground for a hundred years or thereby, it would be equally durable, and fit for the same purposes as Norway or Memel fir, which I have learnt from experience. Allow me to give the reader a single instance, which I trust will justify the above remark.

In the year 1795, at the request of the owner of a house in Bannockburn, Stirlingshire, I made myself some window sashes for his house, from the common Scotch fir, being the wood of some old trees which I had cut from the estate of

Auchenbowie, in the same county. For the same house, and at the same period, I made some sashes from the best Gottenburgh deal then imported:—These sashes were put into oak cases, or frames, where they at present stand, (1820,) being 25 years of age. The Scotch fir sashes looked as well at the time they were put in, and do to this day, and appear to be equally durable, as those made from the foreign deal. There was also made in the same year, and from the same Scottish fir timber, several bound doors which can be seen at this day without any paint equally as fresh looking as when made. I was told the age of those trees did not exceed 80 years. The root cuts of them were remarkably clean and free from knots or blemishes, for 12 and some of them for 18 feet from the trunk, excepting in a few cases, where the branches had been allowed to rot and fall off, which, in some instances, left a loose knot or a hole, which made a very considerable blemish in the board after being cut up. These trees had never been known to be pruned. It is therefore absolutely necessary, and most essential to the value of common Scotch fir trees, that as soon as the branches *begin to die*, or to shew symtoms of decay, that they be pruned off close to the bole or main body of the tree. It is perfectly evident that the fine fir logs imported from Memel are never pruned, and that the branches are allowed to rot off them, since it is a fact well known to the workers of Memel timber, that when a coarse knotty log is cut up, if it does not immediately show a hole in the board, the knots are always ready to fall out on the least pressure when among the hands of the workman.

In the summer of 1818, I was asked to accompany a gentleman of Dundee on board a vessel direct from Norway, loaded with fir battens, which he wished to purchase. Accordingly I went on board, and, after turning over a great many that were on deck, I found they were extremely coarse, indeed more so than any of the kind I had ever seen before. I told the master of the vessel, who was also the merchant, that they were really as coarse as our Scotch fir; and I asked him the reason of their being so knotty, but he at this time declined to give me any reason; and the gentleman whom I had accompanied declining to buy them, we left the vessel. After we had got a considerable way up the quay, from the vessel, the Norwegian captain followed, gave me a tap on the shoulder, and said, he would wish to see me in the afternoon. I then began to suspect that the battens had come from some port in the north of Scotland, and, to ascertain the fact, I was anxious to have a conversation with him. Accordingly I attended at the time, and entered into a conversation with the man, whom I found to be very intelligent. Before he answered me any question, he asked me what line of business I was in? I told him I was a wood-cutter. 'That,' said the Norwegian, 'was my father's trade, and likewise my own in the early part of my life.' I now considered myself as very fortunate in having fallen in with one who could give me some information as to the woods in Norway, which are so much superior in quality to our Scotch fir woods.

In the first place, I enquired as to his battens, I am afraid, said he, you will hurt the sale of them. I assured him I would not, and told him I only wanted a little information as to how they managed their growing woods in Norway, and that if there was any thing very new or very beneficial to be learned as to the nursing up of [illegible] a little [illegible] He smiled, and said that I [illegible] as they had [illegible] the wood in Norway but [illegible] &c. As to the [illegible] and that I know are [illegible] —I have a brother in [illegible] Norway, who is a merchant, and [illegible] this brig is our own, [illegible] he stays at home, and [illegible] or any thing he [illegible] business to take them to [illegible] Scotland and sell them, and take [illegible] My brother bought these [illegible] from a man who had purchased a large [illegible] wood that grew in such a place that [illegible] possible to get it out. The wood [illegible] between 30 and 40 years [illegible] thin upon the ground, and [illegible] to the very root; this made [illegible] very coarse and knotty; and, [illegible] my brother bought them at a [illegible] as no other person would take [illegible] I have remarked to him, that their fir [illegible] so very coarse and knotty, when young, how came it to pass, that I saw a great many small spars brought from Norway, some of which he had on his deck, from 20 to 30 feet long, very small, and perfectly straight, and scarcely a knot to be seen on them from end to end. I also asked how it happened that boat oars were made from small Norway trees, and of these spars and oars I had seen great numbers come from Norway? Hold, hold! says the Norwegian, these spars and oars are not got amongst the young woods at all, but grow among the largest and oldest of our woods. These, says he, are all plants (which we call seedlings) and are always to be found where the wood is closest, and very often grows close by the side of a large tree. They grow very tall and small, and there is no room for the growth of branches; and some of these may be of great age although small. I then took up a spar, and shewed him it was all white wood; I took up another and shewed him it was all red wood; and I also shewed him there was a great difference in the barks of these two spars, and said I conceived them to be two different species of fir trees, and that both of these were a different kind of tree from what the battens were cut from. He said the white wood spar was a different kind of fir tree, but the other spar was the same kind with the battens. I could not help differing from him on this point, as I was certain the battens were cut from what we call our common Scotch fir, I then asked him if he ever had been in any of our woods in Scotland; he said never. I then asked him if he thought he could tell me, if I were to carry him to a plantation in the neighbourhood, if the species of trees were the same as in Norway; he said he could do so perfectly easy. As I was extremely anxious to know this, I told him I would take it exceedingly kind of him, if next day he would accompany me a few miles into the country, when I could shew him all the different species of fir, and have his opinion. The obliging Norwegian instantly agreed, and we set off next morning by seven o'clock for the estate of Fotheringham, about eleven miles north of Dundee, where I was at the time employed in cutting oak wood. Here I had an opportunity of shewing him all the different sorts of fir wood trees which are reared in this country. From him I found, to my entire satisfaction, that the best kind of fir wood in Norway is of the same species as our common Scotch fir. One of his spars was larch; yet he allowed it differed a little from ours. The other spar was the same as our spruce fir, which, he says, grows in vast abundance in Norway, and answers to their white wood, or pine fir, which they import here. I then asked him if ever they pruned any of their fir woods. He smiled, and said 'Never, that would be impossible from their extent;' but he added, that they sometimes thinned them, but even that was not done to any great extent. I had some conversation with him respecting oak bark and barking, but this will come under another head. From all this, and my own experience, I am of opinion, that fir timber could be reared in this country that might in time supply all our demand, both as to quantity and quality, equal to any which is imported.

I requested of my Norwegian friend to bring with him, the next time he came to Scotland, a branch, with some of the cones on it, from all the different species of fir trees he could procure in his country, and then I would be a better judge; which he readily agreed to do, but I have never, as yet, heard any thing more of him; yet I do not despair that he will fulfil his promise.

The average prices of all kinds of fir which grow in Scotland, with the exception of the larch, which is considered the most valuable, and the Weymouth pine, which is considered the least valuable, when sent to the ports of Leith, Glasgow, &c. if fit for roofing, or to cut into boards for house carpenters, for the last three years, has been 1s. 6d. per foot, line measure, and about the same price when sent to any of the coal or lime works, where great quantities of that kind of wood are used. A great number of small young fir trees are used about coal works for what is called pit wood, and when sent to Sunderland or Newcastle, in England, sells at 7s. 6d. or any part in Scotland where it is used, at 6s. 6d. per hundred, lineal or running feet, which must stand 4 inches diameter at the small end.

The spruce fir, or pine, as it is called in Norway, and by many in this country, is a much better timber tree than what many consider it to be, for, although appearing very knotty and coarse, when cut up into boards it is a most useful kind of wood, and makes most excellent plain doors, flooring, or scantlings, and although cut up into thin boards, it neither casts nor twists in the same degree as the other kinds do, although the reverse is generally dreaded. This tree is esteemed of great value by the Norwegians; as also the silver fir, both of which are well worthy of being reared in this country, but especially the spruce, as it grows very fast, and, although used at the age of 40 years, is equally durable as if at the age of 80.

SECTION XXIII.

ON THE LARCH FIR, ITS PURPOSES AND VALUE.

Of all fir trees, the larch is esteemed the most valuable; and we have daily proofs before us that no tree advances so quickly in its growth. Almost all authors agree, that it not only thrives in the poorest soils, but it also grows to a prodigious height and magnitude; and that its wood is much esteemed by every person who is the least acquainted with it, for its great durability. That it possesses an astonishing degree of incorruptibility in the open air, or under water, is not to be doubted. This fact is demonstrated by the History of the City of Venice,—the greater part of which is said to have been built upon piles of larch fir wood, which are not only still fresh, although they have remained there for many hundreds of years, but they have also acquired such a degree of hardness as in some measure to resemble iron, so as to resist the edge of the best tempered tool. Let it only for a moment be considered how useful a wood, possessed of these valuable properties, might be to a country such as Britain, which depends so much upon its navy for its preservation and well being, particularly as it promises to be a ready substitute for the oak ; indeed, for certain purposes, it would seem to possess more value.

Although the straightness of the larch does not make it suitable for knees in ship building, yet it could be made to grow crooked for ribs ; but supposing it were taken for outward planking, it might perhaps be more valuable for that purpose than the oak, as it would be much lighter and more tough, and possibly may resist the worms better in warm climates; at any rate it would not be so apt to splinter from shot during the time of an engagement, which would doubtless be the means of saving useful lives that are not unfrequently lost by the splinters of the oak. Connected with the properties which has been mentioned, we ought to remember that as it is of much quicker growth, that the nation could much easier supply their demands with this kind of timber than with oak ; all which considerations, should make it meet the attention of every landholder who is a sincere friend to his country.

The larch wood too is reckoned of such a quality as, compared with every other wood, to resist the fire in such a degree, as only to consume slowly, in the midst of intense heat.

The inhabitants of Italy prize this tree very much. Besides using the timber for all valuable purposes, they use the bark for tanning of leather; and from the body of it, while growing, they extract that resinous balsam commonly known by the name of Venice Turpentine, which yields the country a very considerable revenue. The profits arising from it must be considerable; it being generally computed that a vigorous larch tree will yield seven or eight pounds of turpentine every year for forty or fifty years, and the usual selling price of this resin, I am informed, is about 6d. per pound; but supposing it were only 2d. or 2½d. per pound, the annual produce at the above rate, would amount to at least 1s. 6d. per tree. A Scotch acre contains 500 trees, at the distance of between 10 and 11 feet from one another; at which rate, the annual produce of each acre would be £37 10s.

The larch fir tree, besides being excellent for ship building, is supremely adapted for all sorts of house carpentery, such as joists, roofing, flooring, and also bound work. Workmen, however, object to it, on account of its being so remarkable ill to season, as it is almost impossible to keep it from bending and twisting; so much so, that most tradesmen say it is altogether impossibly to make a straight piece of work from it; also, that it is so very hard, when seasoned, as to make it very ill to smooth with the plane. Many schemes have been tried to cure this evil, when cut up into thin boards or spars. Some, whilst in the log, adopt the method of steeping it in water for twelve months, and then take it out, and dry it properly before cutting up. In this case, it takes twelve months more to dry after it comes out.

The most efficient method that ever I could find out for seasoning the larch wood,—and I have tried many different plans, before I fell upon the present, which experience has taught me,—answers the purpose most effectually.

In the summer of 1815 and 1816, I was employed to thin some plantations for James Johnstone, esq. of Alva, on his estate of Denovan; and also in the same years, for Thomas Spottiswoode, esq. of Dunnipace. The trees on both estates were of considerable size, and particularly those on the estate of Dunnipace,—many of them containing betwixt 30 and 40 solid feet of timber. As part of the trees on both estates were to be used by the proprietors for their own purposes, I had, the year before, cut down and barked a considerable number of larch fir trees, which being barked after being cut down, and exposed to the summer's sun, they rent in such a manner as to render them almost of no use. To prevent, if possible, this in future, I barked all the larch trees standing, and allowed them to remain in this state till autumn, which effectually prevented them from renting with the sun or drought. A number of the trees on Dunnipace estate, stood in this peeled state for two summers, and were then cut up; and Mr Spottiswoode caused his carpenter to make from the timber of these trees some bound doors, and, I believe, some windows, which made an excellent job, and no part of the wood casting or twisting, may now be seen in the porter's lodge at the eastern approach to Dunnipace house. Since that time, I have myself used, and have frequently seen used by others, the timber of larch fir trees, after having stood twelve months with the bark taken off, then cut down, and immediately cut up into battens for flooring, and also made into bound doors for the better sort of houses, and with equal success. This is a clear proof that the plan of taking off the bark from the larch fir trees, some time previous to their being cut down, will not only prevent the timber from shrinking and twisting, but I am of opinion that it has also a tendency to harden the timber, and make it more durable, as it gradually throws out the resinous substance to the surface, and causing it in a greater or less degree, to circulate through the whole timber; and this in so particular a manner, that the white wood of the tree is found equally as hard as the red wood. The consequence to me has been, that I am now decidedly of opinion that the timber of a larch fir tree treated in this way, at 30 years of age, will be found equally durable with a tree cut down at the age of 50 years, and treated in the ordinary way.

From all that has been stated, I now beg permission to say, that I am confident fir timber could be reared in this country to answer all the purposes that fir wood is required for, and that we might make ourselves quite independent of our foreign neighbours.

The average prices of larch fir timber, when sent to the ports of Leith, Glasgow, &c. &c. when of sizes fit for cutting up into roofing, joisting, or flooring, is about 2s. or 2s. 3d. per foot; but would fetch much higher prices from the tradesman, if its qualities were better known.

SECTION XXIV.

ON THE USES AND VALUE OF SMALL HARD WOOD.

When hard wood trees of any description are sold by the solid or cubic foot, when standing, the customary way of calculating the timber is by measuring the whole, with all branches, except such branches as do not exceed six inches diameter, or four inches and a half on the side; for if the purchaser is at the expence of cutting the trees down, &c. he is generally allowed all the wood of inferior branches, to meet his expences. When the branches of trees or young hard wood, under the above sizes, are sold by the foot, they are sold at an inferior or reduced price; and when young trees, or even the branches of large trees, are sold in this way,—say for barrel staves, &c. as in Section 16th,—they are measured down as low as 2½ inches on the side of the square.

All the brush of hard wood, under the sizes stated, or what may even be above it, if it is not fit for any other purpose, is sold by the ton weight. There are large quantities of this kind of wood to be met with in the cutting of coppice wood, cut at the age of from 15 to 25 years, and which is termed ton wood. It is much used for the purpose of extracting, or as it is generally termed distilling, from it a liquid which is used at bleachfields and callico print works. When wood of this description is sent to Glasgow, where there are extensive works for the purpose of distilling it, it sells readily at from £1, 2s. to £1, 10s. per ton; but when there are large cuttings, particularly of young woods, it is worth while to erect boilers near the wood to distil it, as these boilers can be erected at no great expence, and in this case the liquid is easily carried in casks to where it is consumed, at less expence than the rough timber could be;—of course it will pay much better. Small wood of this description is also used for charcoal: but in distilling it, there is part of it made into charcoal, which will supply the demand of that article, so that it is by far the most profitable way, when there is any great quantity to dispose of, to erect boilers, and distil it; unless where the local situation of the wood will admit of it being shipped at a small expence, and carried to where the works mentioned are carried on.

All kinds of wood will give the extract in question, excepting fir; but oak, ash, Spanish chesnut, and birch, are the best. In many parts of the highlands this ton, or brush wood, is used for fuel; and where there is no coal to be had but at a great expence, it will sometimes be found to pay better to sell it as firewood than to dispose of it in any other way. Oak coppice wood also furnish great quantities of spoke wood, which is likewise considered under the size of measurable timber. These are cut for chaise-wheel spokes; long spokes are from 30 to 32 inches by 3½ inches broad, and 1½ inch thick, and the short ones for the same purpose, from 22 to 24 inches long, and same sizes otherwise. Cart-wheel spokes, from 26 to 28 inches long, 4 inches broad, by two inches thick. These are the sizes they require to stand when rough blocked from the axe; and, in this way, they are sold at the prices as in Section 16th.

As these spokes must not have the heart of the tree in them, they are, after being cross cut to the proper length, either split through the middle with an axe, or cut with a saw, and are most generally made from the cleanest of the wood. Small wood, when sold by the solid or cubic foot, for spokes, sells at 2s. per foot, and is measured down to three inches on the side of the square.

SECTION XXV.

OF THE BARK OF TREES THAT MAY BE USED, AND IS MOST GENERALLY USED, IN TANNING, WITH ITS VALUE.

I HAVE been informed that a great many different kinds of bark are used in the dyeing of cloths; but of this I am not sufficiently acquainted. I shall therefore confine myself to those kinds which are, or might be, used for tanning leather, as this is the only sort of manufacture that consumes it to any great extent. Those trees whose bark is universally used for tanning, are the oak, the Spanish chesnut, the birch, the larch, and the rowan tree. The average prices of these different kinds for the last three years, say 1817, 1818, and 1819, and adding the different prices in all the shires in Scotland together for that period, taking the medium for the average, the prices stand as follows:—

Best Scotch oak bark, commonly known by the name of highland coppice bark, per ton*.	£14	15	4
Spanish chesnut do. per do.	12	10	0
Birch do. per do.	7	10	0
Rowan tree do. per do.	7	7	0
Larch fir do. per do.	7	0	0

The oak bark of full grown or old oak trees, as it is generally very corky, sells £2 and sometimes £2 10s. per ton lower than the young or coppice oak bark.—All the above different kinds of bark, during the late war, were at least four pounds per ton higher in price than the above statement.

As it is agreed on by all, that the bark of oak and other trees in general is only useful in tanning, on account of its astringent quality, which has the effect of contracting the pores of the leather, so as to resist moisture; whilst at same time it tends much to the preservation of the leather. We may therefore naturally conclude that the bark of any tree, or even of any vegetable, that is possessed of an astringent quality, will be of use in this respect, proportionally to its degree of astringency; but this is a quality for which the bark of trees in general are more particularly remarkable, as there are very few trees which do not possess it either in a greater or a less degree. With the view, therefore, of discovering the degree of astringent qualities the bark of every kind of tree possesses, and to compare it with that of the oak, which would show at once the comparative value of each, I applied to a medical gentleman, conversant with chemistry, to inform me how I could best arrive at the object I had in view. He had little hesitation in saying he could point out an effectual method. His plan was by taking an equal quantity of the liquor of each kind of bark, and the same quantity of oak bark liquor, and putting them into transparent glass vessels, of the same size and form. This being done into each of the glasses, there should be permitted to fall a drop or two, according to the quantity of liquor, of the solution of green vitriol. By this means will be seen which of the liquids possesses in the highest degree the quality of astringency, as the liquor will immediately change to a blueish colour. The deepness of the hue or tinge each takes, points out the proportion of astringency belonging to each.

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* The prices here stated are given with the supposition that the bark is delivered at the tan-yard in any county town, or at a sea-port near the works.

This trial I made by taking a small quantity of dried oak bark, and an equal quantity of the following kinds; steeped them separately in an equal quantity of water for three months, stirring them frequently. Also tried the same, by boiling each kind, putting the liquor of each kind into glasses, and putting into each the same quantity of vitriol; and on trying them in this way, the degree of astringency was as follows:—

1. The oak struck a deeper tinge than any of the others.

2. The ash and hornbeam. These two were nearly equal, and very little inferior to the oak.

3. The Spanish chesnut nearly equal to the ash.

4. The green willow, the bay-leaved willow, the common hoop willow, the grey willow, and the Huntingdon willow, were all about alike, but all a degree fainter than even the chesnut.

5. The birch and the beech a considerable degree weaker than the Spanish chesnut, and not nearly equal to the ash.

6. The rowan tree, or mountain ash, a great deal inferior even to the birch, and also to the willows.

7. The common broom, when taking the bark alone, nearly equal to the oak; but when taking the small twigs, and chopping it along with the bark, only equal to the rowan tree.

8. The laburnum a degree weaker than the rowan tree,

9. The larch fir equal to the birch.

10. The spruce and silver fir a degree weaker than the larch.

11. The common Scotch fir a small degree of astringency, but much weaker than any of the other firs.

12. The bramble bush, taking bark and all boiled, equal to the chesnut.

13. The saw-dust of the oak timber when boiled, equal to the chesnut, and very little inferior to the ash bark when steeped.

14. The small brush of the tops of oak trees, chopped small and boiled, equal to the ash.

All these kinds, as they possess a considerable degree of astringency, will tan leather; but the beech bark is so very thin, and so difficult to be separated from the tree, that it can scarcely be obtained; nor would the bark of the laburnum be worth while. The ash, when it is reared in any quantities, in natural woods, could be very easily peeled without much injury to the timber when it is small; but when the tree is large, it would injure the timber very much to take the bark off it. But when ash bark can be obtained, it will be found very little inferior to the oak, and stronger than either the birch or the larch, which is in general used.

I also tried the plant called the dockan, which is to be found almost every where in great quantities. Its astringent quality is of nearly the same strength as the broom. I therefore think the common broom, the bramble, and the dockan, might be good substitutes for the bark of trees in tanning of leather; but granting these substitutes should ever be resorted to in place of the bark of the oak, or any other tree, it will not much lessen the value of the timber. To convince the reader of this, he will please look back to Section 10th, where the value of the foot of oak timber is placed at 4s.; and considering the sizes of the trees there mentioned, there is only about 6d, per foot reckoned on the bark.

SECTION XXVI.

THE METHOD OF VALUING AND ASCERTAINING THE QUANTITY OF BARK, &c. ON AN OAK COPPICE WOOD.

I HAVE frequently been applied to by foresters and others to give some description of the readiest and surest method of ascertaining the quantity of bark, &c. and consequently, the value of a coppice wood before it was cut down. I lie under many a promise to perform this task; and I confess it was much more difficult than I at first imagined. Were I desired to go to a growing wood of any description, of the extent of from one to ten thousand acres, and to give its value, I would find no difficulty in giving the value of wood and bark, &c. and that too within 5 per cent. either way. But to say that I or any man could lay down a rule for doing this work, without the person being a little in the practice of it, is altogether impossible. Were it measureable timber, as will be afterwards shown, it would be more easy; but in taking young natural wood, where there are perhaps a thousand stools on each acre, and these averaging 5 or 6 stems from every stool, and not one of the measurable timber; (even this, however, were in some degree tolerably easy, if you have the number of acres, and can ascertain the number of stools and stems ou each acre.) The truth must in a great measure be ascertained by partly guessing at the average quantity of bark, &c. each stool will produce. But when the ground is not measured, it must be worse. Granting the whole wood ground were measured, if a person has not each acre by itself in order to ascertain the number of stools on each, and the average number of stems from each stool, without which it is impossible to proceed in this work with any accuracy. And it is still more difficult when one has no knowledge of the measurement of the ground; and supposing a person had, as it is always the crop on the ground that must be taken, and where the crop is exceedingly various, and the ground in parts almost inaccessible, in this case, without having had a little experience in the line, it is almost impossible for any person, however plain it may be laid down before him on paper, to pretend to ascertain the value with any degree of accuracy.

Besides, the situation and soil will vary the weight of the bark very considerably. The quality of the timber, the thriving or healthiness of the growth of the woods at the time of valuing, will also vary the weight of the bark. If a coppice or natural oak wood, has a northerly or a north-east exposure, the timber will be in general more durable and hardy, but the bark not so thick as when the woods have a southern exposure. In low dens, where the wood is well sheltered from all quarters, and where the growth must be more rapid, the bark will be thicker, and weigh heavier than in either of the former situations, but the timber will be more spongy. The poorest and most rocky soils produce the best or hardest timber, but not so thick or sappy bark as better soils would do. As to quality, all foresters agree in this respect, that wherever oak timber, young or old trees, are well hearted, that is to say, much red wood in it, which is the best of the oak timber, but the bark on trees of this kind is not so good and thick as when the timber has more white or sap wood in it. Also, if the wood is very healthy and thriving, the bark will be better and easier peeled, than when the wood becomes stinted in the growth, and has a great many dead branches on it; in the latter case, the bark too will be a great deal worse to separate from it, and will require a great deal more beating to raise or take off the bark; and in this case, the bark is more dry, and will not weigh so heavy as when the wood is in a thriving state.

In valuing a wood that a person is an entire stranger to, he must consider all these things, and make his calculations accordingly; and having pierced the bark on several of the trees, in different places of the wood, and ascertained its thickness, having some experience of what he is going to be about; and in order to assist him in this, I would submit to his consideration the following observations:

Suppose an acre of coppice oak wood, at 15 years of age, to contain, at 8 feet distance from each other, 855 stools, which an acre of ordinary good ground is very capable of bearing, and these stools averaging 5 stems from each, which is 4275 stems on an acre, these stems at the above age, will, at the least, average 2 lbs. of bark each

stem, which is 3 tons, 16 cwt., 1 qr., 10 lbs. at £14 per ton, is		£53 8 9
Which is 15s. 4d. less than the average price for these last 3 years. (*See Sect. XXV.*)		
16 tons of brush timber in the acre, as above, at 10s. per ton,		8 0 0
		£61 8 9
Deduct expense of peeling the bark, supposing the women employed at 1s. and the men at 2s. 6d. per day, each, is £2, 15s. per ton, for 3 tons, 16 cwt., 1 qr. 10 lbs.	£10 9 11	
Deduct carriage to the tan-yard, at £1 per ton,	3 16 4	
		£14 6 3
Value of 1 acre of coppice, at 15 years of age		£47 2 6

Supposing the coppice 20 years of age, and each acre containing 855 stools, averaging 5 stems from every stool, is 4275. Average quantity of bark on each stem is 3 lbs. which is 5 tons, 14 cwt., 2 qrs., 1 lb., which, at £14 per ton, is		£80 3 1½
10 tons of brush wood, at 10s. per do.		5 0 0
1600 spokes, at £2 per 100		32 0 0
		£117 3 1½
Deduct expense of blocking spokes, at 4s. 6d. per 100,	£3 10 0	
Do. expense of peeling, at £2, 15s. per ton,	15 14 10	
Do. carriage at £1 per ton,	5 14 6	
		£24 19 4
Value at 20 years		£92 3 9½

Supposing the coppice 25 years of age, and 855 stools on an acre, averaging 4 stems on every stool, is 3420; and averaging 5¼ lbs. of bark on each stem—8 tons, 1 qr., 7 lbs., at £14 per ton,	£112 4 1½
Eleven tons of brushwood at 10s. per do.	5 10 0
Two thousand 5 hundred spokes, at £2. per hundred,	50 0 0
	£167 14 1½

Carried forward, - - -				£167	14	1½
Deduct expence of peeling at £2, 15s. - - -	£22	0	10½			
Ditto for blocking spokes, at 4s. 6d. per hundred, - -	5	12	6			
Ditto for carriage, at £1 per ton, -	8	0	9			
				35	14	1½
Value at 25 years, - - -				£132	0	0

Supposing the coppice 30 years of age, and 855 stools in an acre, averaging 4 stems from every stool, is 3420 stems, averaging 8 lbs. of bark on each stem, is 12 tons, 4 cwt., 1 qr., 4 lbs., at £14 per ton, -	£171	0	0
Six tons of brushwood, at 10s. per do. -	3	0	0
Three thousand, 8 hundred spokes, at £2 per hundred, - - - - -	76	0	0
Seven hundred and ten feet of measureable timber, at 2s. 6d. per foot, - -	88	15	0
	£338	15	0

Deduct expence of peeling, at £2, 15s. per ton, - -	£33	11	9			
Ditto for blocking 3800 spokes, at 4s. 6d. per hundred, -	8	11	0			
Carriage of bark tô the tanyard, at £1 per ton, - - -	12	4	3			
				54	7	0
Value at 30 years of age, - -				£284	8	0

The preceding statement is what an acre of ordinary good wood land, laid out for oak coppice, is very capable of producing, when it is properly trained up; and those persons who are acquainted with cutting and managing natural oak wood, will at once see that I am rather below than above my estimate. The nearness or *distance* of the situation of the wood to or from the market for the bark, will either lessen or advance the carriage, as will also the alteration in wages make either the expence of manufacturing less or more; but for all these things allowances must be made.

I have made no allowance for the cartage of the spokes, because there is scarcely any part in all the country but there is a wright that requires that article, and he generally gives that price for them in the wood; but if the quantity should be too great for that particular part of the country, it is easy to make allowance for the carriage. I have allowed 6d. on the foot of the measurable timber to carry it to a sea-port, &c.

The surest method of estimating the crop as it stands on the ground, without regard to the acres or measurement of the land, is to count the stools into twenties, and to take the average number of stems on every 20 stools; then take the average quantity of bark on every stem, the average quantity of spokes every stool will produce, the average quantity of measurable timber in every stool, and the average quantity of brush wood on every stool. Having set down all these, carefully and accurately, in a memorandum-book, go through the whole wood in the same way, and add the whole together. Take the bark, by the ton, say at the nearest place you expect to sell it; the spokes, by the hundred, at where you expect to deliver them; the measurable timber, by the foot, at the port at which you expect to sell it; and the brush wood, by the ton. Add these together; then, make an allowance for the carriage of your bark, spokes, measurable timber, and the expence of cutting and peeling the bark, also the blocking of the spokes. Add these together, and deduct the amount from the former sum, and the remainder will be the value of the wood. The readiest method of counting the stools is, to cause two men to take a line, say about a hundred feet long, or more, and passing the line round as many of those stools as it will inclose, the one man standing still while the other moves round a new number of stools, and count always the stools betwixt the two lines, causing the one man move the one time with the line, whilst the other man stands still, and so on alternately. The valuator at the same time, taking care to average every twenty stools as they go on, before losing sight of the counted stools.—This way too is a very speedy and sure method of counting the number of trees in any plantation. Or the stools of a coppice wood may be counted and averaged by two men going parallel to each other, and the person valuing going betwixt them; the two men putting up marks with fog, or pieces of white paper on a branch of the stools; the one man going always back by the last laid marks, and the valuator always counting and averaging the stools betwixt the newly laid and the late laid marks; counting and averaging the stools always as the men go on, taking only 20, or even 10 stools, at a time. To those who have been in the practice of doing this frequently, it will be found very easy, and will be done very speedily, and with a very considerable degree of accuracy. The proper method of learning to do this correctly, is, when a person cuts an oak wood for the first time (or even were the work repeated several times), he should, in order to make himself perfectly acquainted with ascertaining the average quantity of bark that a stool or even a stem of a stool will produce, he ought to go before the peelers, and select a stool or stem. After having examined it narrowly, he supposes it to produce a certain quantity of bark, and marks this down in his memorandum book. He then causes a person to peel it by itself, dry it, and carefully tie it up, and weigh it, and compare it with the weight he supposed it to produce, and he will at once see how near his calculation came to the truth. By frequently repeating this, he will soon be enabled to come near the truth, without making such a trial, but even without being at so much trouble as to dry the bark itself. I have often weighed it after being peeled, and allowed one third part of the weight for the sap, which in bark from 15 to 30 years old, will be found to be very near the true weight of it after it is dry; but if the bark is much older, or say the bark of large trees, it will take considerably more than one third part of the green bark to make it hold out the weight when dried. I have also tried it, by measuring the stems of a stool, and reducing them to solid feet and inches; and I have found this to be a very satisfactory way of finding the quantity of bark.

For example, a stem of oak from a natural stool—suppose it to measure in girth 2 inches, by 7 feet long, it will contain 2 solid inches and one-third of an inch, according to the measurement of Hoppus. This stem or shoot, will produce 2 lbs. 2 oz. of bark. Again, a stem or shoot of natural oak, measuring 4 inches in girth, by 9 feet in length, will be found to contain 1 solid foot of wood, and will produce 13½ lbs. of bark. Let it be observed here, that natural shoots of oak will produce more bark according to their measurement, than young oak trees reared from the plant will do, as the trees from the plant require more pruning than those from the natural stool; as the rougher the coppice is, or the more branches are kept on, the more bark it will produce. See Section 9 of this work, also the plate of coppice trees. If it is intended to cut the coppice very young, little or no pruning is necessary.

If the forester will take the trouble to try all these different methods, as I have done in the most of the counties in Scotland, he will find them to come very near the truth. As to the plan of ascertaining it by the solid feet or inches, in very small stems or trees, the bark will vary a little, according to the quantity of branches peeled below what was measured.

I am aware, that here I run the risk of not falling in with the opinions of some of my readers, and even that from many of those who pretend to be good judges of the value of oak coppice woods. Such will insist that it is impossible for an acre of coppice oak wood, at 15 years of age, to produce L.47 2s. 6d.; or that an acre, at 20 years of age, will produce L.92 1s. 9¼d.; but particularly, that an acre, at 25 years of age, will produce L.132 12s. 6d; and beyond all credibility, that an acre, at 30 years of age, will produce L.248 8s. 0d. In answer to this, however, I might point out the place where such results were obtained, and produce evidence of the facts; nor were these made on the best natural wood I have seen. But if the reader who doubts, will consider the following, and make proof of it in ordinary good coppice wood, he will at once acknowledge that I am rather under than above the real calculation. It surely need not stagger the belief of any person who is in the smallest degree acquainted with rearing of natural oak woods, to see a natural oak stool at 15 years of age, bearing 5 stems each, which will make 2 paling stobs, and of course will measure fully more than 2 solid inches, and one-third of an inch. Nor is it at all uncommon to see thousands of natural stools of oak at thirty years old, producing four stems, each of which will average one solid foot; and of course will produce upwards of three stones of bark, which will be seen to be far above the calculation, either at 15 or 30 years old; but if I were to select the best growths I have seen at the different ages mentioned, I should go far above either of these calculations. But I have been careful in the foregoing, to select only those acres, by carefully attending to the cutting and rearing up of which, in the manner herein laid down, the poorest soil of natural wood land (marshes excepted) in Scotland, is capable of producing.

Were I to give instances of the growths of natural oak stools I have seen on good soils, I would not exceed the bounds of truth, although I were to double the proceeds herein stated. —For the sake of those not acquainted with rearing wood, allow me to give the four following examples, taken from actual measurement.

A Table, showing the growth of several natural stools, and seedlings of oak, taken from actual measurement.

PLACES WHERE THE DIFFERENT MEASUREMENTS WERE TAKEN.	Ages of the Growth.	First Stool.	Second Stool.	Third Stool.	Number of stems in all.	Average measure of each stem.		Measurement of the whole put together.	
						Feet.	Inches.	Feet.	Inches.
On the estate of Ormiston Hall, in East Lothian, taken in 1804.	30	5 stems.	4 stems.	3 stems.	12	5	0	60	0
In Glen Shirra, near Inverary, Argyleshire, taken in 1810.	25	6 stems.	5 stems.	4 stems.	15	3	6	52	6
Three stools of ash, on the estate of Boquhan, in Stirlingshire, taken in 1812.	20	6 stems.	5 stems.	4 stems.	15	3	4	50	0
Bankend wood, estate of Touch-adam, Stirlingshire, which I cut in 1804; measurements taken in 1820.	16	8 stems.	6 stems.	4 stems.	18	0	4	6	0

Seedlings measured in the said coppice, which, when the wood was cut, must have been at least 3 inches in circumference, 3 feet from the ground, and from 4 to 6 feet high. These were the largest sizes left in Bankend wood, when cut. At Ormiston Hall, in 1804, 12 of the best seedlings put together in said wood, only measured 49 feet 9 inches. In Glen Shirra, in 1810, 15 of the best of the seedlings in said wood, put together, only 33 feet 7 inches. In the wood of Bankend, which wood is still growing (in 1820), 18 of the best seedlings only measure 4 feet 5 inches.—The bark is included in the foregoing measurements.

By this statement it will be seen, that natural stems of oak make far more rapid growth than seedlings, or from the plant; nor are they near so liable to misgive in rearing.

I grant that the foregoing measurements were taken from very thriving stools, and which stools grew on a good soil; but it would be very possible (and no one who is acquainted with the subject will doubt it) to have 600 stools on an acre of good land, which would place each at 10 feet distance from each other every way, and these, at the age of 30 years, to average 4 stems from each stool. But granting they only were to average 3 solid feet from each stem, which is less than those at 25 years of age, there would be 2400 stems on an acre, average 3 feet each, which is 7200 feet, which, at 2s. 6d. per foot, (a low price, including bark) is no less than L. 900 Sterling per acre at 30 years old. Who would not think oak woods worthy their attention in rearing, after considering what it is possible to gain by them?

Since writing the above, I have been favoured, by J. Francis Erskine, of Marr, esquire, with the date of planting some large oak trees, which I cut on his estate of Alloa in 1817. They were planted in 1706 and 1707. Many of them measured upwards of 140 solid feet,—one in particular, which grew between a lime and a poplar not more than 8 feet distant from each other, measured 62 feet 9 inches in length, of a straight bole, and the girth on the side of the square 13¾ inches.—A poplar planted at the same time, and cut in 1817, measured 235 solid feet. Many oak trees still stand on the same ground, planted at the same time, and will measure 150 feet.

SECTION XXVII.

OF MAKING ALLOWANCES FOR THE BARK WHEN MEASURING AND VALUING GROWING TREES.

When trees are old, with their bark on, it is common to make an allowance to the purchaser for the thickness of the bark; and the allowance to be made is supposed to reduce the tree to what it would be, if the bark was stripped off. Various disputes have arisen of late years betwixt sellers and buyers, as to the allowances for bark; and scarcely two measurers will, in measuring a quantity of round rough timber with the bark on it, come within 5 or 6 feet in 100, of each other. Hence it is become very common in many places, for the buyer, when he makes the purchase, to make a clause in the agreement, for the bark to be stripped off every piece, where the girth is to be taken. It is true, that the bark of all kinds of trees varies very considerably in thickness, according to age and size. If

the following rule be attended to, it will be found to be very near the truth, in all kinds of timber, beech excepted, which does not require so much allowance as the other kinds of hard wood, the bark being rather thinner.

From ¼ of the girth or side of the square,		To ¼ of the girth or side of the square.			
From 3 inches	to	6 inches	deduct	½ inch	of the side or square.
6 do.		9 do.		¾ do.	
9 do.		12 do.		1 do.	
12 do.		18 do.		1¼ do.	
18 do.		& upwards		1½ do.	

When the trees are measured growing, with my newly-invented machine, the extreme girth or circumferences of the tree are taken, from which deduct as follows:

When the girth or circumference is any thing

From	12 inches	up to 24 inches,	deduct	2 inches.
......	24	...... 36		3 ....
......	36	...... 48		4 ....
......	48	...... 72		5 ....
......	72	and upwards,	deduct	6 ....

The above deductions will be found to answer in almost all trees, the same as if the bark were stripped off; unless in very old rough corky barked trees, or when there is much fog growing on the bark. When the girth is taken in this case, it may require a little more allowance;

but of this the practised measurer will easily judge. And let it be here observed, that when trees are measured lying in the wood where they were cut, and if sold to be carted or shipped to any distance, the allowance should be made more fully, in order to make it stand out, than if the tree were lying where it was to be used; as by carting, &c. &c. a little of the roughness is rubbed off the bark; and in many cases, when only one-eighth part of an inch of the extreme girth is lost, it takes one-fourth part of an inch of the side or square, when the girth is taken with a line.

For example, when the girth is taken with a line round the tree, the line is doubled and applied to the foot rule; and the half of what the double line measures on the rule, is taken for the side of the square, which is one fourth the whole girth. And when the line is doubled, and applied to the foot rule, unless the line comes to an inch or half an inch, should it only want one sixteenth part of an inch of the double line, it is not counted, but thrown away; nothing but fourths of an inch being taken, in this case, nearly three-eighths of an inch are thrown away of the double line; which is about three quarters of an inch often lost on the whole girth of line measure.—See this explained more particularly in measuring with the newly-invented machine for measuring growing trees.

SECTION XXVIII.

OF VALUING FULL GROWN OR MEASURABLE TREES.

The value of all kinds of trees, excepting those whose bark is used, and is of value as well as the timber, is easily ascertained, by their measurement, which is taken in solid feet and inches, according to Hoppus, the standard measurer through Britain, for all kinds of timber.—Having taken the length and girth of a tree, or trees,—the way and manner of which is described in explaining the measuring machine, —and having brought the tree to solid feet and inches, and having also fixed on the price per solid foot, that such a tree or number of trees is worth, you will at once ascertain their value. But it requires a very different manner of calculation to ascertain the worth of those trees whose bark is of value.

Let us first begin with the oak tree, the bark of which is the most valuable. And here it may be proper to observe, that a great difference of opinion, as to the method of ascertaining the value of an oak tree, with its bark, exists, as every valuator has his own peculiar way of doing it. Hoppus, that excellent timber measurer, says, that the value of the bark of each oak tree, generally holds to be about a third part of the value of the body and head. But it appears from this, that Mr Hoppus had not been a practical measurer and valuator of oak trees, with their bark; for this will not hold good in one tree out of a thousand.

For example, if we take hedge row trees, or trees in very exposed situations, that are what is generally termed scraggy trees, such as have short trunks or bodies, and large spreading tops, without any measurable branches on them,—a tree of this description will be found to have more value of bark, according to its solid measure, than a tree whose body or trunk runs up towards the very top of the tree, and has little or few branches on its top.

Suppose you have an oak tree on the outskirts of a plantation or a hedge row, whose top has had abundance of room to spread.—Say its body or trunk measures 9 feet long, by 9 inches the fourth of the girth or side of the square, the trunk will measure 5 solid feet; and it having a very large top, but no measurable branches on it such as will stand 6 inches square, which has been already observed is only reckoned measurable timber,—such a tree will contain 10 stones of bark; which, at 2s. 3d. per stone, is L.1, 2s. 6d for bark; and reckoning the timber at 3s. per foot, it is only 15s. for timber. Here the bark of this tree is worth 7s. 6d. more than the measurable timber; and many such trees as this are to be met with.

But let us take another example. We have an oak tree, which measures 20 feet long of a body, and 12 inches on the side of the square, which makes 20 solid feet. And suppose there are as many branches on its top above 6 inches as measure 10 solid feet, making in all 30 solid feet, then very few branches on this tree being fit for barking or being peeled, it will be found only to produce 22½ stones of bark; which, at 2s. 3d. is L.2 10s. 7½d. Now, 30 feet of timber, at 3s. per foot, is L.4 10s. Here the timber of the tree is L 1, 19s. 4½d. more in value than the bark. But adding the value of the wood and the bark together, we find it L.7 0s. 7½d. which makes the above tree to be worth, on an average, wood and bark included, 4s. 8¼d. per solid foot. Now, let us add the wood and bark of the first tree together, which makes it L.1 17s. 6d.; which, including wood and bark, on an average, is 7s. 6d. per solid foot.

A great many, in valuing measurable oak trees, go on the following data, that every oak tree will produce one stone of bark for every solid foot of timber; and a great many insist, from this holding good in every case but in the two examples, which are taken from actual measurement and weight, amongst many more that might be given, show the absurdity of this way of calculating, in which both the seller and buyer have been in many cases deceived—and more particularly, if the trees are sold by the foot, while growing.

To give one striking example of this:—In the year 1806, I was called to superintend the cutting of 250 oaks (all hedge row trees), which were purchased on an estate in Clackmannanshire, at 3s. per foot, bark included.

When the trees were cut down, a sworn timber measurer from the port of Alloa, was called to measure them, which he did accordingly, and made about 1000 feet in the whole. None of the timber of these trees being measured under 6 inches, of which a very great part consisted, and all them having large tops, I weighed from of the above 250 trees, (measured 1000 solid feet) of good dry bark, ready for and delivered to the tanner, 1865 stones, which was very near two stones of bark for each foot of measurable timber.

Here it may be proper to observe, that some oak trees, though not so valuable for their timber, may be better worth 7s. 6d. per foot than others that have more valuable timber, may be worth 4s. 6d. per foot.

From what has been already said, it will be easily seen, that, as trees are so various in the sizes of their tops, which is the great means of their producing less or more bark, according to their measurement, it is impossible to lay down a perfect rule for ascertaining it, without examining minutely the tree itself. A practised measurer when he sees the tree, must judge of it accordingly; every tree, therefore, the bark of which is of value, particularly the oak, must be valued by itself.

After taking the measurement of the timber in solid feet and inches, set it down at what per foot the timber of such a tree is worth. Then calculate on the quantity of bark, in stones and lbs. that such a tree, according to the quantity of small timber that is not measured on it, will produce of bark, and set down the price per stone that it will sell at. Then add the two together, and you will obtain the gross value of the tree. This is certainly the surest way of valuing large trees. The method of measuring small trees is explained in Section XXVI.

In valuing coppice trees, let it be carefully observed that the bark of trees, as already explained, will vary considerably in weight, according not only to the size of the tree, but also to the coarseness or fineness of the quality of the bark.—The following observations, taken from actual measurement and weight, may assist a young beginner, in ascertaining the quantity of bark from various trees. An oak tree, about 40 years old, measured down to 4¼ inches side of the square, and weighing only the bark peeled off the timber that is measured, without including any of the bark of the crops, &c.—every foot of measured timber will produce from 9 to 11 lbs. of bark. An oak tree, of 80 years old, weighing only the bark peeled off the measuable timber, as above, every foot will produce from 10 to 13 lbs. of bark. Every foot of large birch timber, peeled as above, will produce 14 lbs. of bark. Every foot of rowan tree, as above, will produce 11½ lbs of bark. Every foot of the willow, unless a very old tree, will produce from 9 to 11 lbs. of bark. Every foot of larch fir, not exceeding 30 years old, will produce from 7 to 9 lbs. of bark.

The timber of trees, particularly the oak, is peeled out, every crop or branch, down as small as an inch in circumference; and, as was said before, according to the quantity of branches, or measureable wood on a tree, so will be the quantity of bark.

SECTION XXIX.

OF CUTTING DOWN LARGE TREES.

When trees are to be thinned out of a plantation, and when the remaining trees are to be nursed up to maturity, or even, when large trees are cut out from among young coppice wood, the greatest care ought to be taken, not to hurt the trees remaining. For this purpose, the trees to be cut, ought to be lightened in the top as much as possible, by cutting off a number of the top branches, and particularly those that hang most over the trees which are to stand. This is done, by a person going up the tree with a ladder, and, with a hand-saw, cutting off the impending branches. But this is both a tedious and very dangerous operation, and might be more safely and speedily done, by fixing a hand saw to the end of the connecting rods for working the measuring machine; and by giving the saw a little extra setting, a person may stand on the ground and cut off a branch of any size or height from a tree with ease and safety. A few rods, a little stronger than those used for the measuring machine, with the connecting screws a little larger, say about 1¼ inch diameter, with a thin plate of iron on the end of one of the rods, to screw it to the hand saw. Rods kept for this purpose would be of great use in pruning trees, and would be attended with many advantages. In cutting large trees, that stand nearly perpendicular, in order to make the tree fall the way required, enter the cross-cut saw on that side of the tree it is intended to fall, and cut it about a third part through; then enter the saw at the other side, and when it is cut so far as to admit a wedge, place the wedge exactly opposite the way you want the tree to fall, and keep driving it slowly, till the tree is nearly cut through. Be sure the saw meets the opposite cut equally on both sides; and not imagine, as some have done, that, by making the saw meet sooner through the one side than the other, that the tree will fall to the the side soonest met or first cut through, when, on the contrary, the side of the tree longest in being cut, is that side to which the tree will naturally fall.

By attending to the above hints, it will be found very easy to make a tree fall any way; but if the tree has a heavy top, or if it inclines very much to that side on which it is not intended to fall, it will be necessary to make use of a rope. For this purpose, the connecting rods will be found very advantageous, by having a hook at the end of one of them, so that the rods may carry up the rope, and fix it on the top of tree, without the very dangerous and laborious work of a person going up the tree to fix it.

SECTION XXX

OF BARKING OAK WOOD, AND PREPARING THE BARK FOR THE TANNER.

THE time to commence the barking or peeling all kinds of wood has already been pointed out in Section VIII. of this work. All that I intend here, is to describe the manner of peeling and otherwise manufacturing the bark. With this view we shall suppose that the forester is about to commence the operation of barking, and that he has engaged a proper number of the best instructed men and women that can be had for barkers, according to the extent of his undertaking. The barkers are each furnished with light short handled mallets, made of hard wood, about 8 or 9 inches long, 3 inches square at the face, and the other end sharpened like a wedge, in order the more easily to make an incision in the bark, which is done all along the side of the tree which happens to be uppermost, in a straight line; and as two barkers are generally employed at one tree, or large piece of timber, it is proper, that whilst the one is employed in making an incision with the mallet, as above, the other being furnished with a sharp instrument, called a bill, or *whittle*, resembling a hedge bill, with which the bark ought to be cut across the tree, in lengths of from 2 feet 6 inches, to 3 feet. Having thus made the incision in the bark, both ways, the barkers being also each furnished with what is called peeling irons, which is an instrument made of iron about 6 inches long, 1½ inch broad in the face, sharpened like a wright's chissel, a little bended in the broad way, the more effectually to go round the tree, having a handle of wood about 4 inches long; and if the tree or piece of timber to be barked is such as the two barkers can easily lift one end of it, this is placed on 2 pieces of wood, 3 feet long, and called horses, these are about the thickness of a paling stob, and has a forked end on each about 6 inches long, the other end sharpened to go into the ground; two of these horses are placed in a triangular form against one another, one end of the piece to be peeled being raised on the horses, the two barkers standing opposite to each other, and entering the peeling iron into the incision made by the mallet, and pressing the iron downwards between the bark and the timber. In this way it will be found very easy to take the bark off in one whole piece round the tree, and, if possible, take the bark off in one whole piece, as long as the incisions made in the bark. In some cases where there is not much sap, the bark may require a little beating with the square end of the mallet, to cause it to separate easily from the wood; but the less beating with the mallet the better, as it has a tendency to blacken the bark in the inside, or fleshy part of it, so that when the tanner sees it he supposes it to be damaged, and undervalues it. The branches of the tree being previously all lopped off with the axe, the persons, in number according to the extent of the work, with a bill, or whittle, smooths all the branches, cutting them in lengths of from 2 feet 6 inches to 3 feet, down as small as one inch in circumference. The barkers, principally women, are each provided with a smooth whinstone about 6 or 8 pound weight, beside which they sit down, and, having collected a quantity of sap, lings, branches, or twigs, they hold it on the stone with the one hand, and, with the mallet in the other, they beat the piece till the bark be split from the wood, from the one end to the other, and taking it off all the length of the piece if possible, then lay it regularly aside, till a bundle of considerable size is formed.

The point most particularly to be observed in this art is, putting the bark up to dry; which is done by putting the bark upon what is called the lofts or ranges. These are erected by taking forked pieces of the loppings, called horses, the one 3 feet long, the other 2 feet 6 inches; and driving each about 4 inches into the ground, opposite one another, about 3 feet asunder in the breadth, and as much betwixt them, lengthways, as will admit long small pieces of wood to be put upon them, and as many of these must be put together as will hold the bark of every day's peeling. These ought to be erected in as dry and elevated a spot as can be found in the wood. The bark being carried and laid on this loft, with the thick ends of it all laid to the high side of the range, and the small bark laid to the thickness of about 6 inches; and the bark taken off the largest of the wood laid regularly on the top, which serves for a covering; and the lofts or ranges having a declivity of about 6 inches, the rain will run off them readily; and if properly put up in this manner, they will keep out a great deal of rain. After it has lain in this state for three days, if the weather is good and dry, it ought to be all turned over; and the small bark spread out, so as not to allow it to sit together, which, if much pressed, it is apt to do; and if it does so with the natural sap in it, it has a chance of moulding, which is extremely hurtful to the bark, and both lessens it in weight and in value. After the bark has stood on the ranges about eight or ten days, if the weather be good, it may either be put into a house or a shed, or if intended to be put up into a stack it may now be done. A stack of bark ought never to exceed 8 feet in width, and 12 or 15 feet in height, raised in the middle like a hay stack; and if it is intended to stand any time, it ought to be carried without the new cut wood, or hagg, and put up in as airy a place as possible; and on no account whatever ought the bark to be stacked above any of the newly cut-oak stools. If it is to stand any length of time in the stack, it ought to be thatched either with straw, bog-reed, long heath, or broom; and if in good order when put into the stack, it may remain in it, if necessary, all winter, but if it be intended so, it must be removed beyond the new cut hagg altogether. The greatest care ought to be taken to preserve the colour of the inner parts of the bark, because the colour of it is generally looked to as a principal criterion of its value, and the merchant or tanner judges of its value chiefly by its colour. Before being put into the stack, the natural sap ought to be dryed out of it, in order to prevent its fermenting; because if a fermentation takes place in one part of the stack, it generally goes through and spoils the whole.

The same mode of treatment will do for all kinds of bark as well as the oak; but the birch, the larch, and the willow, will peel in April.

In barking the birch, which has an outer or shredy skin upon it, that is of no use and rejected by the tanner, and must be peeled off. When the bark is ready for the tanner, it has to undergo the work of chopping, which is done by driving in two or more stobs into the ground, with a fork on the upper end of each, leaving them about 2 feet 6 inches from the ground, and laying a long small piece of wood across between the two, where a number of people stand, and the bark is carried and laid down behind them, which they take up in their hands, and lay it on the cross tree, and then, with a sharp whittle or bill in the other hand, they cut it into small pieces, about three inches in length; when this is done, it is trampled into bags which hold about 2 cwts. each, and in these bags it is weighed when sold by the ton, in tons, cwts. quarters, and pounds, English weight, and when sold by the stone it is generally weighed with Dutch weight, and in the above manner delivered to the merchant or tanner.

SECTION XXXI.

CONDITIONS OF SALE FOR A COPPICE WOOD.

ARTICLE 1. The purchaser is hereby bound to cut all the barren or black wood of every description, the oak excepted, on or before the 1st of May next.

Article 2. The purchaser shall be also bound to cut all the plants or seedling trees included in the sale, with a saw 2 inches above the surface of the ground, and to dress the stool with an adze, rounding it down from the centre, close to the surface of the ground; and on no pretence whatever shall he be allowed to peel off, or even to loosen in the smallest degree, any part of the bark below the cut of the adze; and if a stool that has been formerly cut, to be cut and again dressed down, and rounded towards the top, so as not to lodge water on either of them, as directed in Section 6 and 7 of this work, these stools to be immediately dressed up after the trees or stems are cut, that is to say, every tree or stem cut, the stool shall be dressed up the same day it is cut, so as the young suckers or saplings may not be in the smallest degree impeded in their growths.

Article 3. All the brush wood must immediately be removed off the top of the new cut stools; all horses and cattle are expressly prohibited from going at large or pasturing among the new cut stools; and in removing the timber or bark, the carts are not to be allowed to drive over any of the newly cut stools; nor is the bark to be stacked on the top of any of the newly cut stools, unless it is to be removed on or before the 10th of July next.

Article 4. Reserving from said hagg of wood to be cut, all seedlings or young plants of every description, at and under 4 inches in circumference, 3 feet from the ground; as also reserving those and such a number of oaks, ashes, &c. as standard trees; which trees are all marked with a ring of paint, and numbered on the bark with a wood iron, from number 1 up to number —— nor shall the purchaser injure these reserve trees or seedlings in the smallest with the felling or cutting of his trees.

EXPLANATION OF THE PLATE.

Figure 1 represents a fir tree, the branches of which have been allowed to rot off, and of course leaves a blemish in the tree.—See Section XXII.

Figure 2 represents an oak tree properly pruned; and in order to make it grow crooked, the horizontal branch is kept on the main stem, and the perpendicular one lopped off, and otherwise pruned in the top, in order to make it grow more crooked.—See Section II.

Figure 3 represents an oak tree, such as figure 2, and having been dealt with when young as figure 2, has become a fine crook, the horizontal branch having become so strong as to work in with the main stem, and will answer almost any purpose about a vessel, and of course is the most valuable of all trees.—See also Section II.

Figure 4 represents a tree of ash, plane, or beech, properly pruned up, in order to make it have a tall clean stem, which is the most valuable in such trees.—See Section II.

Figure A represents a very old tree that has been badly pruned, and from the blemished places, sends out new suckers, and, although apparently healed up, when the timber of it is cut up into planks, it is all spoiled and almost fit for no use, at same time, having one whole side still appearing to be in a thriving condition. Many trees of this description are to be seen in the oak park at Hamilton, belonging to his Grace the Duke of Hamilton, which trees are said to be many hundreds years old.—See Section II,

The figures of coppice trees represents the different ages of the coppices, as in Section XXVI, at same time, the manner of cutting, &c. as in Sections VI. and VII,

OF WORKING THE MEASURING MACHINE.

The method of measuring round timber trees is accurately described by Mr Hoppus, in his excellent book of measurements, and as his is the standard and customary measurer, I would refer the reader to it in measuring unequal grown trees. After having taken the length of the tree in feet and inches, which length may be taken by the rods as already described, the girth is most generally taken at half the length, which girth we may now proceed to take with the measuring wheel; this is easily done, by putting up the wheel, with as many of the connecting rods together as will easily put it up to the height required; then, suppose there is no branches in the way, and having before made a mark on the bark of the tree with the small rods, which has in the end of the uppermost one, a small marking iron for that purpose; this mark is made where the girth is to be taken, and from where you are to take your departure with the wheel, which being done, press the wheel round the tree, following it, and keeping it as level as possible, which the wheel will in a great measure do of itself, by its having teeth like a saw in the hem of the wheel, unless carelessly attended to, and as the wheel goes round the tree, be sure to count the number of times the bell strikes, which strikes at every foot, and when you see you have not another twelve inches or one foot more to run, to come back again to the place where you took your departure from, count the number of inches that it strikes over and above the last foot, and thus you will at once have the feet and inches that the tree is in circumference, of which take the fourth, and this gives you the side of the square; but when there are branches in the way of getting round the tree, you must have a spare handle for the machine, as C, about 2 feet, or 2 feet 6 inches in length, and by altering the swivel-joint at the top of the first rod to any position required, the person working the wheel by the rods can stand in the same place, and put the wheel say half-way round the tree, if it is very large, and by turning the swivel-joint, and reversing the wheel, at the same time sending it round the other side of the tree till it meet where it left off; and by counting the feet and inches as above, and adding the two together, you will at once have the extreme girth of the tree, by taking the fourth of which girth, you have the side of the square—thus one person working the small rods, taking the lengths, and marking for the girths.

When branches are to measure, or when branches are in the way of getting round the tree with the rods, the person with the small rods stands in the opposite side of the tree, and directs the person when to stop with the wheel. Thus, by a little practice in working the wheel, and paying attention to count the feet and inches as they strike; two men will measure growing or standing trees equally as accurately and as expeditiously as if the trees were lying on the ground. A very little practice in working the machine will soon convince any person. The wheel being about eight inches in diameter, it strikes two feet before it goes once round, at same time striking at every foot. Although the tree should have some hollows in it, it will be found to take the girth as correctly as a line will do, as it is and ought to be observed, in taking the girth of round trees, to take it always where the tree is most equal, and free from any swell or hollow places, taking the medium of the tree for the girth, as directed by Hoppus. Indeed some trees, such a spruce fir, may be so confused with branches, that it may be impossible to get the machine at all in amongst them to take the girth; but this is only likely to happen in a tree of that kind, and may not happen in one tree out of a thousand. If the tree is such as you can get in the machine to where you are to take the girth, and if you can see where you take your departure from, and make your stop at, you can be at no loss to take the exact girth; and, by a few days practice in measuring with this machine, it will be fonnd to measure more speedily, and equally correct, if not more so, than taking the girth with a line, as by a line you have first to put it round the tree, then you double it, and apply it to a foot rule; you then take the half for the side of the square, whereas this machine gives you the exact feet and inches from the top of the highest tree, without the help of any other rule. This machine will also be found very useful in taking the length of logs, but especially crooked timbers, as you can easily run it along the centre of the curve, which is the fairest way of measuring crooked timber. It may also be applied with advantage to take the length of a large crooked limb of a standing tree, where there is one of the sides clear of small branches, by running it up the centre as already described.

Having finished what I hope will be found useful, as a guide to the forester, in as short and concise a manner as I could, and having all along been guided by experience, I hope that it will in some measure answer the ends intended. It had been suggested to me, after the work was nearly finished, that I should give a description (as is done by many authors) of the largest trees of every kind I have seen, with observations on the situations and soils for which they are best adapted. These, however, are so numerous, that to enter on the subject at length I was fearful would swell the book far beyond the limits which I intended—whilst such a discussion does not altogether come within the design of the treatise which it was my object to lay before the forester at present. At a future period, however, it is not unlikely but I shall treat on this subject,—and in the meantime will apply myself to it, so as to make myself well acquainted with it.

FINIS.

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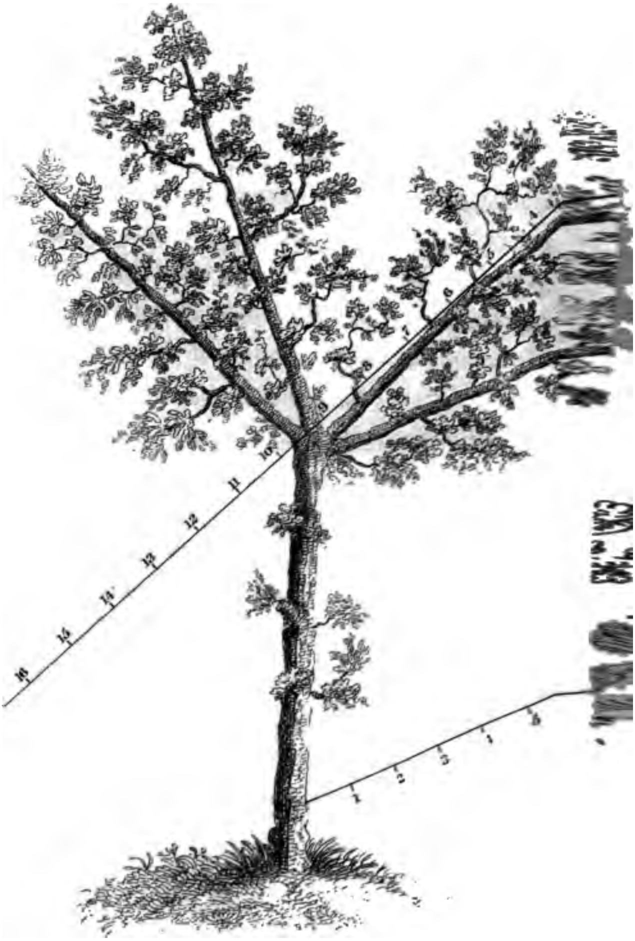

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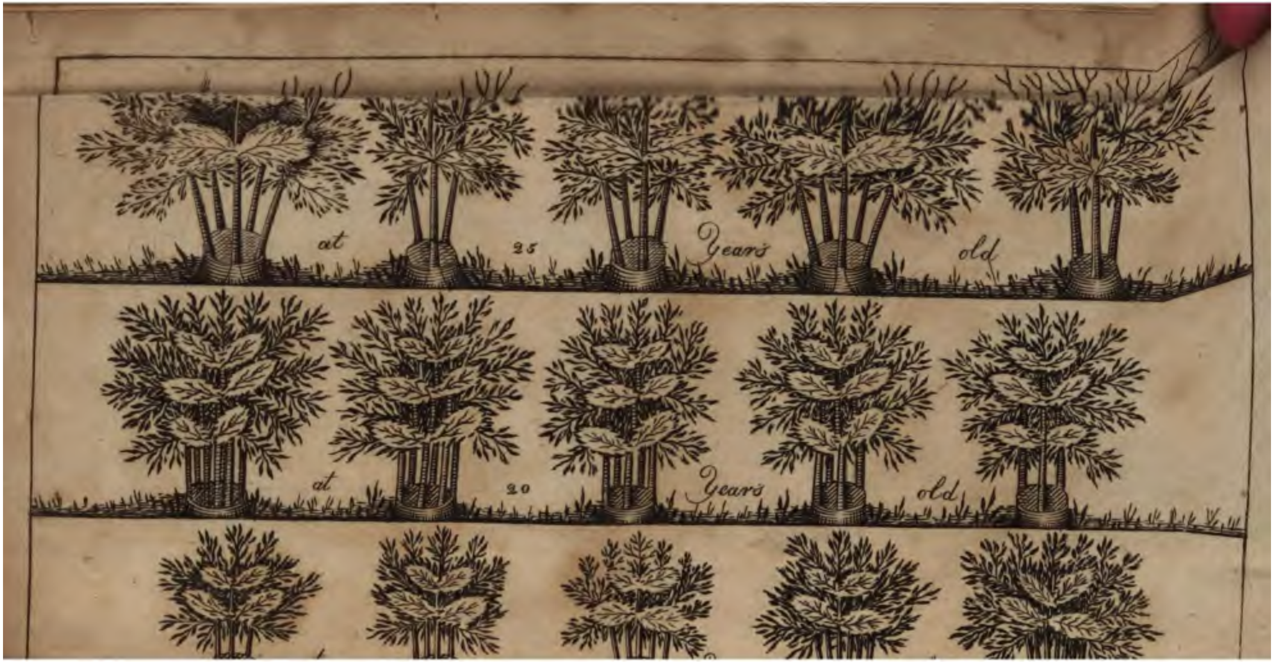
at 25 Years old
at 20 Years old

ENGRAVED. for *Monteath's Forrester's Guide*